



Missouri Department of Natural Resources

The State of **Missouri's Environment:** *2007*

Director's Message

Imagine a glass of grape juice at the edge of a table, teetering above white carpet. What's your first instinct? Leave it there, or slide it to the center of the table? For most of us, the answer is simple: Move the glass to prevent an accident.

This is the backbone of our philosophy toward environmental protection: Taking steps to prevent environmental spills and mistakes is more efficient and cost-effective than cleaning them up after the fact. It's also infinitely better for the environment and public safety. This philosophy, also called compliance assistance, has been one of my guiding principles since joining the department in January 2005.

Through our recently implemented ombudsman program, for example, we've been able to reach out to people who may need assistance, rather than waiting for them to come to us. In just the first year since its inception, our ombudsmen have contacted 2,145 citizens, community leaders, business owners and other groups. As of October 2006, ombudsmen and I have met with more than 1,000 citizens at 73 town meetings to ask questions, discuss concerns and learn more about our department and its services.

Our Environmental Assistance Visits, or EAVs, are another important component of our compliance assistance efforts. During EAVs, staff from the department visit permitted sites and walk permittees through their unique requirements. During these informal visits, compliance assistance is provided with the expectation that corrections will be made if the department discovers any problems. In a recent survey nearly 99 percent of respondents reported that they felt well served by Department of Natural Resources staff who visited their operations as part of EAVs.

In addition to ramping up compliance assistance efforts, our department has also been working to improve customer service. Our expanded satellite offices in Portageville, Maryville, Rolla, Willow Springs,



Fredricktown, Warsaw and Carthage have allowed us to place assistance closer to the people who need it.

Recent improvements to our department Web site also have improved our customer service by enabling users to access many of our manuals and forms online. As part of ongoing efforts to make our permitting process less cumbersome, the department began making permit, registration and certification forms available in word processing format. This change enables businesses to complete these forms electronically and save them so they can easily be updated for future submissions.

When I joined the department, I heard from many citizens who had questions or concerns in their communities, but were afraid to approach our department because of past occur-

rences or, in some cases, unfounded rumors or myths. While we can't change the past, we can influence our future, and I hope that the many accomplishments detailed in this report will give heart to those working to protect Missouri's environment. As you look through this report, you'll see that improved compliance assistance and better customer service have indeed resulted in a cleaner, healthier environment for all Missourians.

Missouri's communities face many challenges in the future. Many parts of Missouri, for example, are looking for ways to secure adequate supplies of clean, safe water to support their growing populations, and finding stable funding to support infrastructure improvements will be critical to the health of Missouri's economy.

In August 2006, 111 of Missouri's 114 counties passed the parks-and-soils sales tax. This vote sent a clear message to our department that our work is not yet done.

Missourians still see more improvements to be made to our land and water resources, and maintaining our award-winning system of state parks continues to be a priority. Rest assured, we've heard your message loud and clear.

Doyle Childers

Director, Missouri Department of Natural Resources



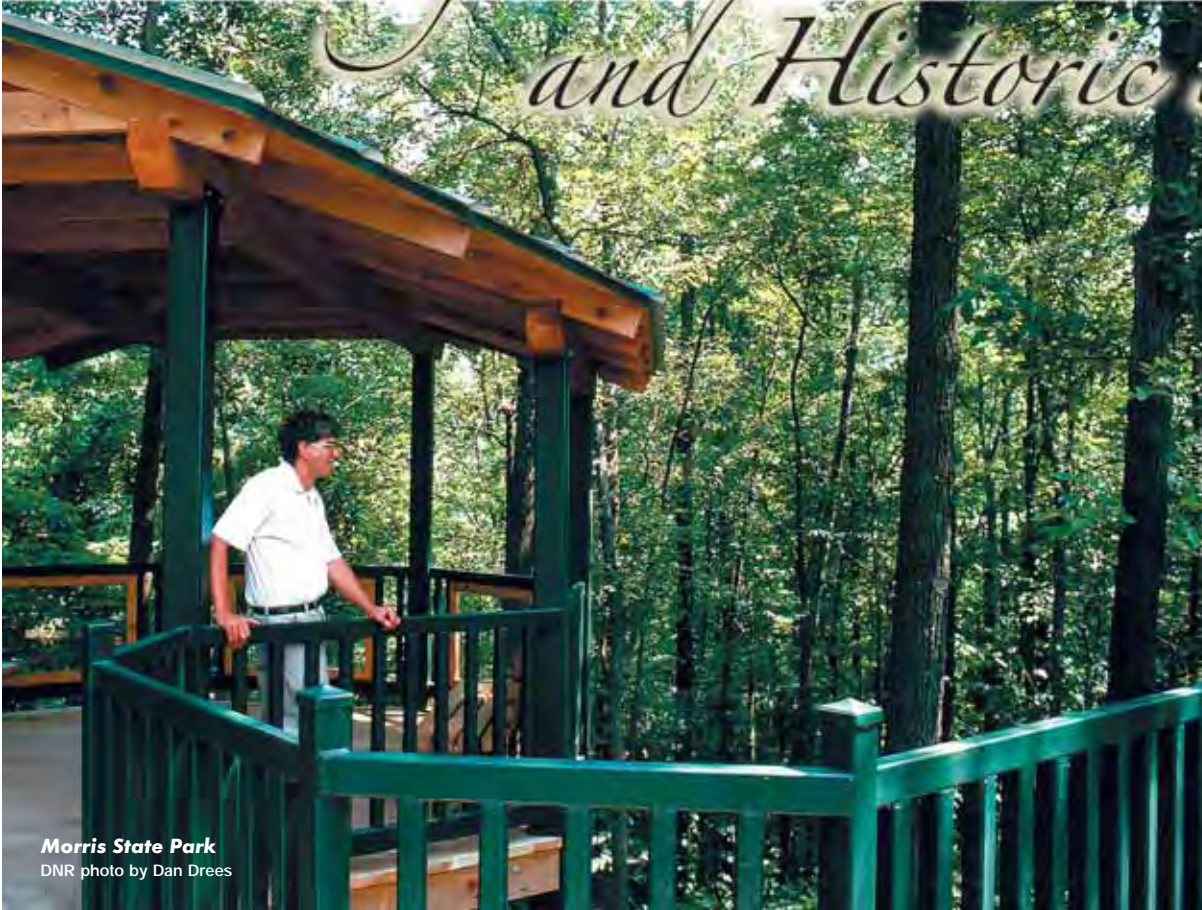
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**All photos taken by Scott Myers, Department of Natural Resources, unless
otherwise indicated.**

Preserving Our State Parks and Historic Sites



Morris State Park
DNR photo by Dan Drees

Missouri state parks and historic sites are the showcases of Missouri. Within their boundaries, visitors can step back in time at a Civil War battlefield or step down a boardwalk that takes them into a collapsed cave system. The areas are protected so visitors can experience the natural resources of the state as they should be – with clean air, clean water and preserved landscapes.

Missouri legislation creating a state park system was passed in 1917 and the first state park tracts were acquired in 1924. Today, the system includes 83 state parks and historic sites encompassing more than 140,000 acres, plus access to 61,000 acres in the Roger Pryor Pioneer Backcountry. More than 17 million people annually visit the state parks and historic sites. The park system also provides an annual economic impact to Missouri's economy of \$538 million.

The mission of the state park system is to preserve and interpret the state's most outstanding natural landscapes and cultural landmarks and to provide recreational opportunities. To accomplish this mission, the state park system preserves pieces of Missouri's history, including homes of famous Missourians such as Mark Twain and Harry S Truman, Civil War battlefields, gristmills, covered bridges, and sites that tell the stories of early American Indians. Many sites have guided tours while others have interpretive information that visitors can read on their own.

Missouri's most outstanding landscape and natural features are preserved here for everyone to enjoy – forests, savannas, glades, prairies, wetlands, lakes and streams. Features such as caves, sinkholes and natural bridges can be explored. These settings provide many opportunities for recreation such as camping, hiking, fishing, picnicking,

horseback riding, canoeing and just exploring the great outdoors. Park staff provides programs to help visitors understand and enjoy the natural features of each area.

The Missouri state park system includes some unique sites, such as Katy Trail State Park, the longest developed rail-trail in the United States; Edward "Ted" and Pat Jones-Confluence Point State Historic Site, which is located at the confluence of the two greatest rivers in the nation – the Missouri and Mississippi; and Watkins Woolen Mill State Park and Historic Site, which includes the only 19th century American woolen mill with its original machinery still intact.

In 2005, two important new sites were dedicated. Iliniwek Village State Historic Site is the site of a village inhabited by the American Indians of the Iliniwek Tribe. Morris State Park, which was donated by an individual,

preserves a unique landscape in Missouri's Bootheel.

The Missouri state park system has consistently been ranked as one of the best state park systems in the nation and has a very high satisfaction rating with visitors. It was recognized in 2005 as one of three nationwide finalists in the 2005 National Gold Medal and State Park Awards Program. Based on feedback gathered through guest comment cards distributed throughout state parks and historic sites, overall visitor satisfaction in 2005 was 94 percent.

The Department of Natural Resources is able to operate this high-quality state park system because of the stable source of funding from the parks-and-soils sales tax. This one-tenth-of-one-percent sales tax is divided equally between the state park system and efforts to stop soil erosion, both within the Department of Natural Resources. The tax was first approved by voters in 1984. A 10-year extension of the tax has been approved overwhelmingly three times by voters. The latest vote was in August 2006 and the renewal was approved by 70.8 percent of voters, the



Meramec State Park
DNR photo by George Denniston

highest approval rate. The department believes this high voter approval reflects the overall support that Missourians have for their state park and historic site system.

This sales tax provides funds for three-quarters of the state park system's budget that does not receive any general revenue. This stable funding source has been used to maintain and upgrade the state park system to better serve the needs of the visitors and protect the resources. Structures and facilities have been maintained and upgraded, and areas have been improved.

Infrastructure is often unnoticed but is vital to the state park system to protect the resources. Examples of infrastructure improvements in 2005 included upgrading water and sewer systems, closing abandoned lagoons, and developing new drinking water distribution and storage systems. Spill prevention and control and counter-measure plans were developed for 26 state parks. Rock Bridge Memorial State Park and Route 66 State

Park were connected to public utilities. The first-ever Environmental Management System (EMS) for Missouri state parks was developed and implemented for St. Joe State Park and Missouri Mines State Historic Site. An EMS incorporates environmental conscientiousness into the mission and goals of any project.

Campground improvements were a major focus in 2005. These improvements included increasing the number of electrical campsites, upgrading existing electrical campsites and renovating shower houses and restrooms. In 2005, approximately 230 basic campsites were upgraded with electricity. This brings the total number of campsites upgraded with electricity to approximately 500 in the last two years. This effort is moving toward a goal of having 70 percent of the park system's 3,500 campsites offering electricity, which is more in step with the demand by campers.

Another major improvement in two campgrounds was the addition of camper cabins. Six log cabins are available at Mark Twain State Park and five log camper cabins are available at Stockton State Park. Another type of camping experience is now available at Lake of the Ozarks State Park with the addition of a yurt. This circular structure with a fabric cover and wooden frame is the only one available in the state park system.

State park staff continued to reach out to visitors and citizens through a variety of ways. In 2005, almost 180,000 people attended approximately



Electrification project – Table Rock State Park
DNR photo by George Denniston



**Camper cabin -
Mark Twain State Park**
DNR photo by George Denniston



Yurt - Lake of the Ozarks State Park
DNR photo by David Kelly

300 special events in more than 60 state parks and historic sites in Missouri. These events ranged from spring wildflower walks to historic festivals.

In an effort to reach visitors who may not be familiar with the state park system, the department's Division of State Parks is expanding its urban outreach efforts. In addition to its annual WOW National Outdoor Recreation and Conservation School in St. Louis, the division offered the first-ever WOW National Outdoor Recreation School in Kansas City in fall 2006. These events familiarize participants of all ages and

experience with outdoor recreation skills and opportunities.

Many of the services and improvements that have been made are in response to input from visitors. Public input is very important to the division and is actively sought in a number of ways. State parks and historic sites hold annual informational meetings to provide visitors with opportunities to have input on facilities and services. In 2005, almost 60 infor-



Jonathan Kemper

Leadership, Vision Lead Lewis and Clark Back to Missouri

Two hundred years ago, the vision and leadership of President Thomas Jefferson sent explorers Meriwether Lewis and William Clark on a historic voyage across our uncharted nation to the Pacific Ocean. Two hundred years later, the vision and leadership provided by Jonathan Kemper helped bring them back.

The leadership that Kemper brought to the Missouri Lewis and Clark Bicentennial Commission as co-chairman helped Missouri play a critical role in the four-year Lewis and Clark bicentennial commemoration. This event not only gave Missourians a wonderful opportunity to relive an important part of our history, but it also brought an influx of tourism and a boost to Missouri's economy.

Through his work with the commission, Kemper helped coordinate local community, regional and national activities. Thanks in part to his commitment, Missouri completed more than 50 Missouri Lewis and Clark Bicentennial "Legacy" projects, provided support for 30 community and national Lewis and Clark events and enhanced historic preservation in the state. Kemper also played a pivotal role in the development of the Lewis and Clark sculpture and plaza in Case Park in Kansas City. He also helped obtain a smaller scale of this model, which will be displayed in the Lewis and Clark State Office Building, the Missouri Department of Natural Resources' main office in Jefferson City.

Kemper, of Kansas City, is chairman and CEO of Commerce Bank in Kansas City. In addition to his work with the Missouri Lewis and Clark Bicentennial Commission, Kemper is a leader in local historic preservation efforts. He helped move forward a project that enabled the re-use of the old First National Bank Building in downtown Kansas City into a public library. He also is serving as chairman of the National Trust for Historic Preservation, a significant national leadership position that brings honor and attention to historic preservation efforts in Missouri.

"Great things do not happen without the kind of significant and committed leadership and vision that Jonathan has provided," said Doug Eiken, director of the Missouri Department of Natural Resources' Division of State Parks and executive director of the Missouri Lewis and Clark Bicentennial Commission.

mational meetings were held and more than 1,850 people attended these meetings.

Other avenues for public input include guest comment cards and online surveys. Public opinion surveys are held at various parks and sites periodically. These year-long surveys began in 2005 at Thousand Hills, Roaring River, Castlewood, Route 66 and Meramec state parks and Felix Valle House State Historic Site. These surveys will ask visitors how satisfied they are with their visits as well as collect expenditure data and socio-demographic information. Satisfaction surveys provide input that guides the park system to make both long- and short-term improvements to facilities and services.

With the sales tax renewed for 10 more years, the state park system is looking ahead. Although the tax provides a stable source of funding, sales tax revenue growth is not keeping up with the increasing costs of services.

To address these issues in the long term, the state park system is taking the following measures: assessing staffing levels to identify efficiencies and reduce where possible; aggressively using technology to reduce staff costs and expenses; managing fee structures to ensure fees are reasonable while keeping up with increasing costs; reducing hours of operation and maintenance such as mowing where feasible; implementing energy-saving features as appropriate; and reducing travel.

Another way of increasing services is the use of volunteer help. In 2005, 3,928 volunteers contributed 165,880 hours of service for a total value of volunteer effort at more than \$1.25 million. These volunteer efforts will be aggressively pursued in the coming years as a way to stretch dollars to maintain services.

Protecting the state park system's natural and cultural resources while providing a quality customer service will remain the commitment of the Department of Natural Resources. By addressing some of these long-term issues, the state park system will be able to continue to use tax dollars wisely and efficiently as it looks toward the next 10 years and beyond.



Lodge and Conference Center – Roaring River State Park

CHALLENGES: State Parks and Historic Sites

- Although the renewal of the parks-and-soils sales tax will provide a stable funding source for the next 10 years, the park system still faces financial challenges. The Missouri Department of Natural Resources must continue to provide statewide recreation in concert with natural and cultural preservation.
- To meet demands for increased services with limited resources, the department will need to find ways to identify and implement operational efficiencies. This will include assessing staffing levels, using technology to reduce costs, managing fee structures, implementing energy-saving features and controlling expenditures.
- To meet the demand for new services, the department will identify selected projects that the Missouri State Parks Foundation and other non-profit groups can support.
- Many state parks and historic sites face threats of air, water, light and noise pollution as development expands around them. These issues must be addressed to maintain their sense of place and mission.
- Katy Trail State Park is intended to be a cross-state trail with trail access to the borders of Kansas and Illinois. To do this, the department must find a way to connect Katy Trail with the network of trails in the Kansas City area and connect to the Edward "Ted" and Pat Jones-Confluence Point State Park and Illinois.
- The redevelopment of Johnson's Shut-Ins State Park following the Taum Sauk Reservoir breach will be an ongoing priority.



Clean water is a shared resource – the water quality decisions we make in Missouri can affect more than just Missouri’s quality of drinking water and precious soil resources. Earth is a water planet, and thousands of pollution sources can impair our soil, groundwater and surface water quality. This has far-reaching consequences for all Missourians, as well as our neighbors in other states.

There is a great deal of overlap between the risks that can threaten our land and those that pose a threat to our water. The consequences of many of our choices are interconnected. Across Missouri, schools, universities, businesses, local governments, elected officials, community groups and private citizens work to protect water quality and availability on several fronts. These include: preventing or controlling discharge of pollution to our rivers, lakes and streams and our groundwater; reducing soil erosion; developing a state water plan to ensure adequate water resources for all Missourians; and engaging other states and the federal government to maintain the future beneficial uses of interstate water for each and every Missourian.

Soil Erosion

When soil enters Missouri’s waters in amounts greater than those received through natural processes, it can have a negative effect on aquatic life. As soil is washed away from the land, it can also bring pollutants such as pesticides and fertilizers with it. Some of these chemicals can remain in the water all the way to the Gulf of Mexico. By preventing soils and water that contain agricultural chemicals from entering Missouri’s streams, rivers, lakes and water supply reservoirs, we can protect the quality of Missouri’s water and the waters flowing through the states downstream of us.

Soil conservation programs have kept more than 148 million tons of soil from eroding into Missouri’s waterways.

Currently the rate of soil erosion in Missouri is 5.3 tons per acre per year. Soil erosion is above acceptable levels on 5 million acres. To reach our goal of 95 percent of Missouri’s agricultural land eroding at tolerable levels or less, we need to reduce erosion on 3.7 million acres. We now must maintain our current savings while also reaching those acres that have been more difficult to address.

The Soil and Water Districts Commission, in its “Plan for the Future,” has responded to the growing need to address the water quality issues within the soil and water conservation equation. Agriculture is totally dependent upon water and in turn affects the quality and quantity of water leaving agricultural land. Conservation practices lead to greater water infiltration and less runoff and erosion.

Conservation practices hold water in the upland and release it more slowly into the watershed, increasing soil moisture, helping to grow crops and lessening downstream impacts such as flooding, sedimentation and agricultural chemicals in the water.

Much of the success of these efforts can be attributed to the committed and ongoing support of Missouri citizens for the parks-and-soils tax. In 1984, 1988, 1996 and 2006, Missourians voted to support a one-tenth-of-one-percent sales tax that finances activities by the department’s Soil and Water Conservation Program and the Missouri state park system. Funds are available to provide incentives to Missouri landowners to put appropriate soil conservation practices on the land.

Drinking Water

About 87 percent of Missourians are served by community water systems. The other 13 percent use domestic or multi-family wells. In 2005, 94.2 percent of community populations met health-based standards. The public water systems that violate health-based standards typically are non-community systems and serve a small percentage of Missouri's population. The department has to focus both assistance and compliance efforts on these smaller systems to ensure that all Missouri citizens drink waters that are safe.

Our overall high compliance rate can largely be attributed to our good quality groundwater. Missouri does not have some of the naturally occurring contaminants like arsenic that pose challenges in other states. Most of our water is not naturally corrosive so issues related to lead and copper pipe that have created problems in other parts of the country have not been a major problem here. Nitrates and pesticides are not yet getting into the deep groundwater used by public water systems. Our large rivers and a number of reservoirs are the resources that serve our major population centers.

While the pesticide atrazine was a problem at about a dozen surface water systems in the mid-1990s, effective treatment and good source water protection has practically eliminated the problem. In fact, an increasing number of community water systems are applying to the department to have an approved source water protection plan. By protecting drinking water at its source, treatment costs can be reduced and human health better protected.

One of the biggest obstacles to safe drinking water in Missouri is simply a lack of funding for maintaining and updating treatment facilities. The strain placed on many communities' public infrastructure has continued to grow, while financial resources have shrunk in recent years. The U.S. Environmental Protection Agency estimates the 20-year need nationwide for drinking water transmission and distribution is \$83.2 billion. Missouri estimates that the infrastructure needs to ensure clean and safe water may be as high as \$11 billion over the next 20 years but the shortfall may be as much as \$6.1 billion.

Aging infrastructure continues to pose a significant challenge to main-

taining safe drinking water in Missouri. Failing pipes compromise drinking water quality by allowing contaminants to enter the system, posing a serious health threat. This need can be addressed through funding for improvements; modeling to identify problem areas; inspections for leakage, corrosion and cross-connections; and drinking water facility improvements and asset management plans.

Since 1989, the State Revolving Fund has provided more than \$1.54 billion to 366 Missouri communities to construct and improve wastewater treatment and drinking water facilities. Towns and cities across the state have saved more than \$630 million dollars in interest charges compared to conventional, higher-interest rates of financing. In addition to that, projects financed by the fund resulted in the creation of nearly 35,000 jobs.

The development of small subdivisions also poses a risk to drinking water quality. Developers of some subdivisions plan their developments so that each drinking water source serves less than 15 connections or 25 people, thus avoiding regulation as a public drinking water system. The construction and operation of the water system and the quality of drinking water provided to the people living in those developments are not regulated, which may compromise public health. Also, if or when the subdivision grows to the point of meeting the definition of a public water system, the homeowners association or other responsible party – not the developer – becomes subject to the drinking water law and regulations and

may be liable for costly repair of the system or treatment of the water. The department is focusing on this issue.

Groundwater

Groundwater is one of Missouri's most important natural resources. About 44 percent of Missouri's population relies on groundwater as their source of drinking water. Most public drinking



water supply wells and many private wells are deep, properly cased and properly grouted. Some older, inferior quality private wells are shallow, not properly cased, nor properly grouted. More than 6,500 new wells are drilled each year in Missouri; however, the department estimates that less than 70 percent of these wells are properly certified, and more than 300,000 abandoned wells remain unplugged. Septic tanks, feedlots or even chemical handling sites located near improperly cased wells can easily contaminate

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Water Providers Work Together to Address Regional Concern

Because of the mineralized geology of northern Missouri, that part of the state has virtually no drinkable groundwater. Consequently, the region must rely on creating surface water impoundments to serve agriculture, business and personal water needs. Severe droughts and climatic fluctuations experienced in this part of Missouri over the past several years have brought some businesses and communities in northern Missouri to the brink of disaster. Some communities must pump water over long distances just to meet local needs.



Work begins on a new 2,300-acre reservoir in north central Missouri.

plan to construct a 2,300-surface-acre lake that would serve northern Missouri. The project will include treatment of the lake water, which will then be transmitted as drinkable water to its wholesale members for distribution to their consumers. This concentration of resources saves duplication of services and provides cost savings. After the lake is full it is anticipated that retail water suppliers in the 10-county area would be able to purchase water wholesale for their consumers. Over time the geographic area could extend into other counties as the need dictates.

"The Missouri Department of Natural Resources' support has come in many ways that are beneficial to the natural resources of the area," said Bruce Hensley, manager of the North Central Missouri Regional Water Commission. "One of the primary support efforts of the department has been in assisting in a Source Water Protection Plan. It is extremely important to the board of the North Central Missouri Regional Water Commission that once this water resource is created, it will be protected for all future generations so that they will benefit from this long-term, reliable resource."

Providing a reliable water resource also will allow existing businesses to expand and enable hard-hit rural counties to recruit new businesses. "Only those who have lived in a region that has experienced this roller coaster of drought, then rain, situation over the years can fully appreciate the value and security this project provides," Hensley said.

The North Central Missouri Regional Water Commission has worked to acquire funding to make the lake possible. With help from Sen. Kit Bond, they've secured more than \$27 million.

"The support of Sen. Kit Bond for this project on the federal level and the funding he is providing through the Natural Resources Conservation Service has been critical to the project's success," Hensley said. "Likewise, on the state level, the support and assistance of the Department of Natural Resources has and continues to be prominent to the success of the project."

Cooperation among the members of the North Central Missouri Regional Water Commission is making this extraordinary feat possible, with the beneficiaries being every Missourian in every county served by this reservoir.

"Collaboration and cooperation, along with a regional approach, allows communities and providers to citizens in rural areas the opportunity to do so much more than they would ever be able to accomplish individually," Hensley said. "Getting beyond a 'me' mentality to a 'we' mentality presents opportunities we could never have realized individually."

The need for a stable and reliable water resource to meet the needs of north central Missouri inspired the formation of the North Central Missouri Regional Water Commission. Present members of the commission include Sullivan County Public Water Supply District No. 1, the City of Green City and the City of Milan. Associate members include the City of Unionville and Public Water Supply District No. 1 of Grundy County.

Since formation of the organization approximately six years ago, this group has met with local utilities, government agencies, elected officials and citizens to determine the severity of the dwindling water supply and to form an effective solution. Staff with the Missouri Department of Natural Resources also helped project the future water demands. After extensive research, the North Central Missouri Regional Water Commission developed a

them. By properly constructing and maintaining wells and encouraging aquifer protection, we ensure safe drinking water for future generations and protect the groundwater resource.

Missouri's aquifers contain an estimated 500 trillion gallons of fresh water. Despite this tremendous resource, groundwater overuse in some areas has caused groundwater levels locally to decline tremendously. The levels in Noel, located in McDonald County, have dropped as much as 400 feet in the past 40 years. Parts of Springfield and the Joplin/Webb

City/Carthage areas experience seasonal problems as well. In addition, prolonged drought conditions have contributed to lower groundwater levels in several regions throughout the state.

Fortunately, most areas have experienced much less groundwater-level change. In addition, chemical wastes and other contaminants dumped at factories and other facilities in the past threaten groundwater. The department aggressively investigates groundwater contamination at these sites and pursues cleanups, if necessary. The Missouri Risk-Based Corrective Action process is

used to provide a consistent and reasonable approach for managing site risks.

The Missouri Department of Natural Resources has been monitoring groundwater levels throughout Missouri since the mid-1950s. A groundwater observation well network is operated by the department's Water Resources Center, and currently consists of 77 wells that vary from less than 30 feet deep to more than 1,800 feet deep. Eighty additional wells will be added during the next two years in locations where increased water use is occurring, and where monitoring capabilities are limited.

Pioneering Cleaner Water for Southwest Missouri Individual's Leadership Benefits Entire Region's Water Quality

The many rivers, lakes and streams in southwest Missouri are among the state's most popular tourism destinations. The fishing, boating and other recreational opportunities these waterways provide draw millions of tourists each year, making them a critical contributor to the region's economy and a precious commodity. Protecting these waters is not only an environmental issue, but an economic one as well. With a growing population, it's more important than ever.

Safely disposing of the hundreds of thousands of tons of litter produced by annual poultry production in southwest Missouri is one of the many challenges this region faces. Often these wastes are applied directly to the land. Over-application of these animal wastes, as well as municipal wastes and fertilization, can jeopardize drinking water supplies.

Many of the efforts to address these problems are being led by Rita Mueller, a coordinator with the Southwest Missouri Resource Conservation and Development Project (RC&D). Described as a pioneer in local water quality efforts, Mueller has worked with the RC&D to develop programs to help local poultry producers develop and implement nutrient management plans to reduce the amount of waste being applied to land in the Upper Shoal Creek watershed. These efforts also help to protect a variety of federally threatened and state-endangered animals and plants.

Southwest Missouri also contains intensive dairy and beef operations with emphasis on forage production, either for hay or pasture. Because of the area's topography, it is extremely vulnerable to surface runoff that may enter deep groundwater or the Niangua River. The watershed area is also a major recreation area providing canoeing, fishing and other outdoor activities, including Bennett Spring State Park. Work by the RC&D has led to funding that enables annual incentive payments to producers for implementing and demonstrating managed grazing systems that protect ground cover, reduce quantity and improve quality of runoff water, and provide more efficient forage production.

"Remember that farmland is still the best use of our land. Agriculture and recreation are the bases of our economy," Mueller said. "We have to help our agriculture producers to protect the environment while making a good living, otherwise the land will be lost forever to development."

This organization also conducted a poultry litter burner energy study, designed to demonstrate and document the operability, economics, fossil fuel displacement, and poultry production impacts of using an on-farm, litter-fueled poultry house heater. Southwest Missouri RC&D was instrumental in establishing the James River Basin Partnership as well.

"Much has been accomplished toward protecting southwest Missouri's ground and surface waters through the partnership among the Missouri Department of Natural Resources, the Environmental Protection Agency, the USDA (U.S. Department of Agriculture) Natural Resources Conservation Service (NRCS), soil and water conservation districts and Southwest Missouri RC&D," Mueller said.

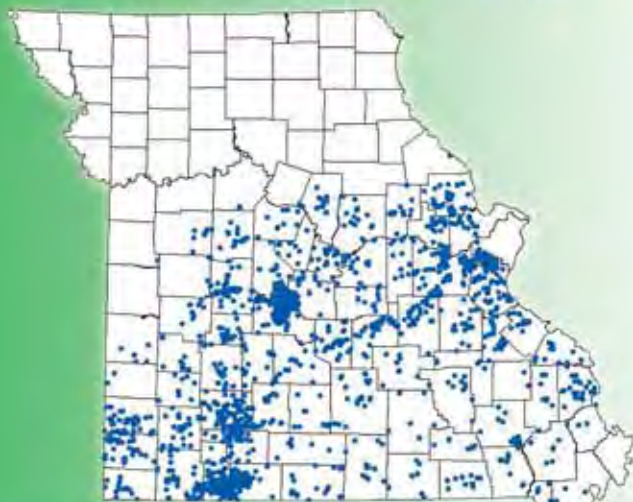
Southwest Missouri RC&D is administered by the USDA NRCS and is sponsored by the County Commissions and Soil and Water Conservation Districts. Southwest Missouri RC&D is a nonprofit that was established and is run by volunteer community leaders. It is dedicated to improving natural resource management and economic development through cooperative efforts.

"We still need to do a better job of telling people how their actions affect water quality and what they can do about it," Mueller said. "Our lakes and streams' overwhelming importance to the economics, aesthetics, and quality of life in southwest Missouri and Missouri as a whole dictates that we give citizens real solutions."



Rita Mueller

Wells That Serve Public Drinking Water With No Treatment



* This map shows the number of communities in Missouri where treatment of drinking water is not needed, thanks to the excellent quality of area groundwater.

August 2006

Community Water Systems with Acute Violations

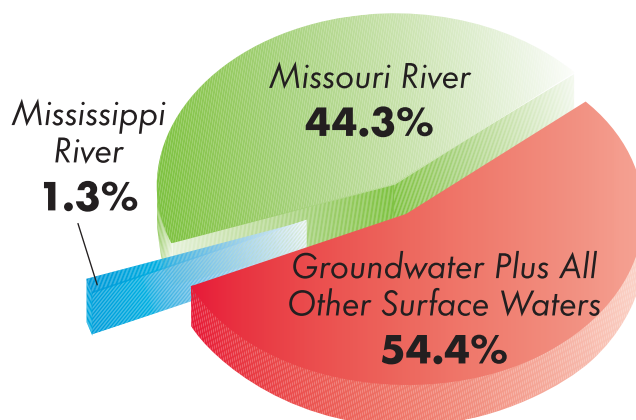
Violations of acute drinking water standards (fecal coliform) occurred in six community water systems during 2006. All violations have been resolved.

Percent of County Populations Served by Community Water Systems With Acute Violations



Missouri's Drinking Water Sources

For Populations Served by Community Water Systems



Protecting Our Rivers, Lakes and Streams

A little more than half of Missouri's 22,172 permanent stream miles fully support aquatic life. Of the 10,900 stream miles that do not fully meet water quality standards, approximately 1,000 miles are impaired by heavy metals such as mercury or other toxic chemicals. Roughly 10,000 miles are impaired by habitat degradation of some kind.

Of Missouri's 293,319 lake acres, approximately 95,000 are threatened by eutrophication, a condition that occurs when nutrient enrichment of a water body leads to increased algae growth. About 70,000 lake acres are impaired by mercury or enriched nutrients.

The Missouri Clean Water Commission adopted a rule change in 2005. The rule change increased the miles of stream affected by bacterial standards from approximately 5,000 to 16,000 miles of Missouri streams and 300 lakes, in addition to those already protected. The standards protect water quality for swimming and designated more than 96 percent of Missouri's classified stream miles for swimming and recreational use. Those that are designated for swimming must meet more stringent bacteria standards.

303(d) List

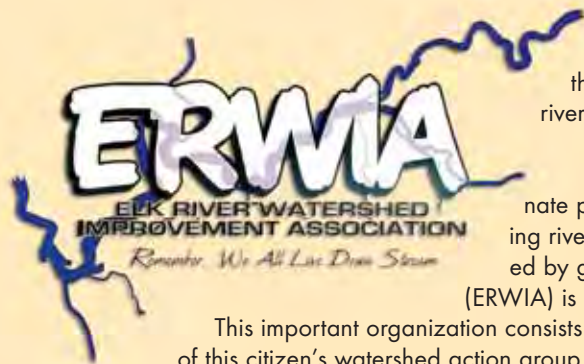
The 303(d) List provides a snapshot in time and helps state and federal agencies keep track of waters that are not meeting water quality standards. Water quality standards protect beneficial uses of water such as swimming, maintaining fish and other aquatic life, and providing drinking water for people, livestock and wildlife.

Since the 2002 303(d) List was completed, there have been changes to the data requirements and methodology, and changes to Missouri's water quality standards. The changes have made the listing process a better, more transparent process.

Once a water is added to the 303(d) List, the department develops and implements a study to correct the water impairments. Generally, this study takes the form of a Total Maximum Daily Load (TMDL) document. The TMDL describes the maximum amount of a pollutant that may enter a

Gathered By the River

Protecting Watershed Requires Tri-State Effort



For many, rivers that wind their way across several states possess a unique charm. Standing along the banks of one of these rivers, it's not hard to visualize the changing landscape the river experiences as it meanders from its starting point in one state to its ending point, sometimes several states away.

These rivers also pose a unique challenge: The need to coordinate protection efforts among multiple states. When it comes to protecting rivers and watersheds shared by multiple states, the leadership provided by groups like the Elk River Watershed Improvement Association (ERWIA) is critical to maintaining the health and safety of these waterways.

This important organization consists of members from Missouri, Arkansas and Oklahoma. The mission of this citizen's watershed action group is to improve, protect and conserve waters within the Elk River watershed. The organization formed, at least in part, as a result of the Elk River Watershed Total Maximum Daily Load (TMDL) document. The TMDL describes the amount of a specific pollutant a body of water can absorb and still meet water quality standards. The department's Southwest Regional Office held public meetings in May 2003 in Anderson, Mo., and Grove, Okla., and participants agreed that a comprehensive and objective local watershed group would be beneficial to address nutrient loading issues in the Elk River and its tributaries, but also to address issues beyond the scope of the TMDL, such as bacteria and sediment loadings.

Though it was the department's TMDL that got the proverbial ball rolling, the ERWIA took the ball and ran with it, and by fall 2003 the organization was operating independently of the department. The organization soon incorporated with rules for membership and a board of directors, and has been an important and shaping force in the tri-state region ever since.

Rosiland Layne, a charter member of the organization and a current member of the board of directors, operates a small cow/calf and breeder hen operation just south of Pineville in McDonald County. Layne emphasizes the importance of proper management in protecting the environment.

"The ERWIA helps community leaders in this watershed to identify and implement better management practices for protecting our valuable land and water resources," Layne said.

Since its inception, the ERWIA has conducted educational activities for students and landowners on subjects ranging from proper nutrient management to the importance of regular septic system maintenance and the benefits of "low-impact development" practices. The organization also has held spring water awareness festivals annually since 2003.

The ERWIA's current priorities include developing watershed management plans for each of the main sub-watersheds in the Elk River basin. These plans will help improve and protect water quality throughout the Elk River basin. This organization is also expanding educational activities for students and landowners, and expanding demonstration projects of best management practices for rural, agricultural, urban and urbanizing areas within the Elk River basin.

water without violating water quality standards. It then allocates portions of this total load to the various sources in the watershed. If an impairment is linked back to a facility with a water permit, the department may modify the permit to bring the impaired water back into compliance.

The Missouri Department of Natural Resources addresses all waters with known impairments; however, not all of these are included on the 303(d) List. The list only includes waters with documented pollution problems that require control plans needed to return the water to compliance. Once the department has completed a TMDL study on the water and EPA has approved it, the water is removed from the list.

Point Source Pollution

This term refers to pollution that comes from a single point, such as a pipe. The number of miles of streams that are impaired or that fail to meet water quality standards because of wastewater discharges has generally held steady since 1984, when statewide data on stream quality first became available. In 1984, 105 miles of classified streams were judged to be impaired by domestic or industrial wastewater. The lowest estimate of this type of pollution was 42 miles in 1996. However, in 2005, point source pollution impaired approximately 101 miles of classified streams. Estimates have increased, in part due to expansion and improvements in Missouri's water

quality monitoring activities that have allowed more accurate estimates of water quality statewide.

Animal Waste

There are about 450 Concentrated Animal Feeding Operations in Missouri. These facilities generate large amounts of animal manure and have the potential to cause serious water pollution problems. Concerns center on the cumulative effects of numerous small animal production facilities in an area as well as the potential for contamination from large facilities.

The department continues to require CAFOs to obtain a National Pollutant Discharge Elimination System permit. Water quality is protected through the

Drinking water intake, Mark Twain Lake, Monroe County
DNR file photo



department's permitting and enforcement program. The department also has established a partnership with the University of Missouri and the Natural Resources Conservation Service to educate and inform producers in proper manure handling. Finding ways to use animal waste safely, particularly poultry litter, will continue to be among the state's top priorities. This is especially important in southwest Missouri where improper handling or disposal of poultry litter can have serious consequences due to the unique geologic characteristics. This unique area is particularly vulnerable to water quality degradation as a result of its karst landscape which commonly consists of springs, losing streams, sinkholes and caves.

On June 30, 2006, the U.S. Environmental Protection Agency published a draft rule regarding water quality regulations affecting confined animal feeding operations.

The most significant change in the requirements of the proposed rule is the Nutrient Management Plan. EPA has proposed to require CAFOs seeking coverage under a state operating permit to submit a facility-specific nutrient management plan for their operation.

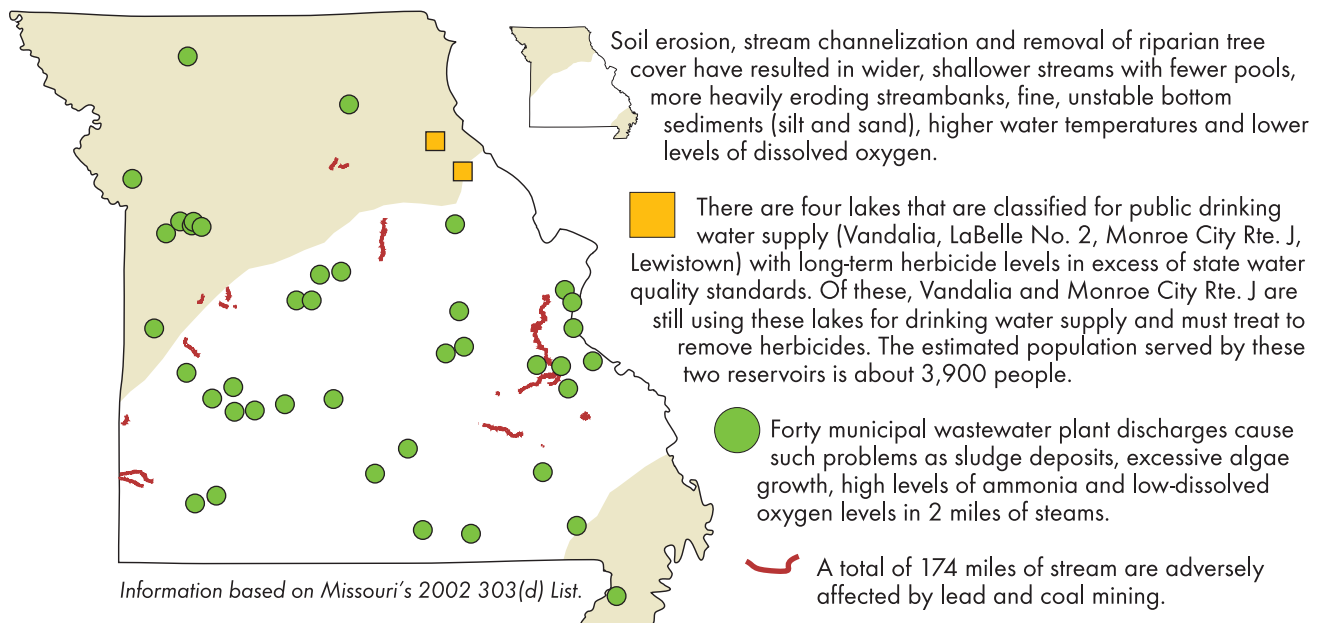
When EPA finalizes the regulations, the department will put the state-level changes on public notice before seeking approval by the Missouri Clean Water Commission. After the statewide regulatory changes have been approved, permit holders and new applicants will be required to amend their state operating permits to satisfy the new requirements. EPA's rule will become final June 30, 2007.

Nonpoint Source Pollution

Nonpoint pollution, a type of pollution that does not come from specific discharges, poses a serious threat to Missouri water quality. Runoff from agriculture, urban areas and abandoned mine lands are all examples of this type of pollution.

This pollution affects almost half of Missouri's streams and rivers and about one third of the lakes. Problems include contamination of drinking water sources with pesticides and

Missouri Water Quality Problems at a Glance



Stream Team's Lucky Numbers Add Up To Clean River

The number 211 has proven to be a lucky one for the Meramec River, as well as the many Missourians who enjoy the scenery and recreational opportunities it provides.

Lucky number 211 represents Arnold Stream Team #211, a group that has been committed since 1991 to the protection of the Meramec River Basin and its tributaries. The number 422 has also proven lucky for the Meramec River Basin; that's the number of active adult members participating in the group. Together, since 1996, members of Arnold Stream Team #211 have spent

- 16,600 hours cleaning streams
- 3,561 hours meeting with new members and planning stream conservation events
- 907 hours working with other agencies on stream protection projects
- 811 hours going to nature and water quality workshops and assisting with training for new members
- 431 hours writing articles about their activities and recruiting new members
- 332 hours conducting water quality monitoring
- 269 hours planting trees to improve riparian protection for nearby streams
- 78 hours conducting watershed inventories of the Meramec River Basin and its tributaries

Most importantly, thanks to this group, many tons of trash have been removed from the Meramec River and its tributaries. Trash has been collected before it could impact the rivers and streams. Tires have been removed from stream bottoms, eliminating sediment traps. Polluters have been contacted and educated about the benefits of protecting water quality. The Arnold Stream Team has set a high mark for stewardship and excellence that other groups can follow.

"The Arnold Stream Team has created a true partnership with Stream Team members, governments and businesses within the watershed," said Priscilla Stotts, volunteer water quality monitor and Missouri Stream Team coordinator for the Missouri Department of Natural Resources. "The team has provided a means for all agencies to work together for the benefit of all and stop the degradation to Missouri streams. Every community can learn from the cooperative effort that the Arnold Stream Team has with the City of Arnold."

This organization serves as a model for potential partnerships between community groups and local officials. Stormwater planners in Arnold and Jefferson County have called on the Arnold Stream Team to assist with educational outreach efforts. The team also has worked closely with the City of Arnold to reduce illegal dumping locally.

"The City of Arnold has been one of our best supporters in our goal of trying to rid the Meramec River (the adjacent flood plain and its tributaries included) of trash that has accumulated over the years," said Bernie Arnold, co-chair of the Arnold Stream Team. "With the city's cooperation, our team has accomplished some major cleanups that other teams would envy."

The Missouri Stream Team program provides those interested in protecting Missouri's rivers a chance to get involved through education, stewardship and advocacy. Missouri is home to 3,130 Stream Teams with about 60,000 members. A Stream Team can be found in nearly every county in the state. Stream Team Program coordinators reported that in 2005, nearly 13,000 volunteers helped clean litter out of Missouri's streams, volunteering more than 73,000 hours of work and removing 788 tons of trash. The over 5,900 trained Stream Team monitors made 1,200 trips to their adopted streams, spending 11,700 hours monitoring for biological water quality and conducting chemical testing. More than 500 volunteers planted 4,190 trees along streams to improve riparian areas that will lead to water quality improvements.

The program is sponsored by the Missouri Department of Natural Resources, the Missouri Department of Conservation and the Conservation Federation of Missouri.



Girl Scouts assist Arnold Stream Team #211
Photo by Bernie Arnold

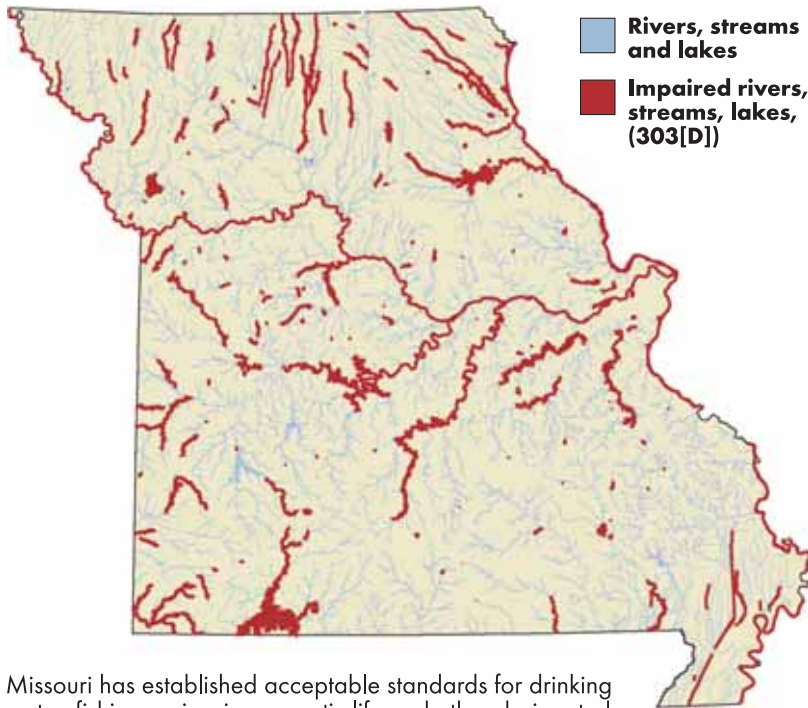
effects from channelization or the modification of stream channels, mining operations and atmospheric deposition of acid and mercury from coal combustion.

Channelization degrades aquatic life in 17 percent of Missouri's streams. Large channelization projects affecting many miles of streams are no longer occurring. Unfortunately, many smaller or shorter projects continue to reduce the number of miles of natural stream channels that occur across the state. Streams channelized many years ago provide poor aquatic habitat and add to flooding, high water velocities and streambank erosion.

Cities, mining areas, construction sites and farms continue to look for effective ways to address storm water runoff. Federal regulations adopted by Missouri reduce the size of disturbed ground requiring a storm water permit from five acres to one acre. Storm water runoff discharge permits are issued for construction sites and other areas with more than one acre of disturbed ground.

Large sand and gravel mining operations require a general permit for storm water runoff and smaller operations have been provided with guidelines for best management practices, in addition to the permit required of all sand and gravel operations.

Waters on Missouri's 303(d) List



Missouri has established acceptable standards for drinking water, fishing, swimming, aquatic life and other designated uses. Waters that don't meet these standards are placed on a special list called the 303(d) List. A stream is considered impaired when it fails to meet water quality standards established by the Clean Water Commission. Section 303(d) of the federal Clean Water Act requires states to identify and list all impaired waters. The list is revised and updated every two years. After studying the scientific data, waters are added or subtracted from the list depending on the status of their health. *Information based on Missouri's 2002 303(d) List.*

Assessment of Water Quantity

Missouri is working to improve its knowledge base of information regarding water supply, water use, and assessment of future needs. A planned expansion of the groundwater observation well monitoring network will broaden the capability of monitoring groundwater levels statewide by nearly doubling the number of observation wells. Real-time, surface water flows will be measured for numerous rivers and creeks after the planned installation of nearly 40 new stream gauges throughout the state. In addition, lake bathymetry studies (level-volume measurements) have been performed for approximately 35 lakes and reservoirs in Missouri and provide data to water suppliers for determining water volume available for use.

Drought

Portions of Missouri have experienced severe to extreme drought conditions during the growing season for five out of the past eight years. The current drought began in July 2005 and as of Sept. 19, 2006, 104 of Missouri's 114 counties remain in some phase of drought designation. Precipitation deficits in excess of 13 inches were reported across the western, west-central

Organization Working to Keep Northwest Missouri Afloat

There are certain things we take for granted. When we turn on our faucets, for example, we expect to be able to fill our glasses with clean, healthy water. Unfortunately, what may seem like a given in most parts of Missouri has become a precious and finite resource for those living in northwest Missouri.



In this part of the state, water supplies are inadequate to meet the demands for people, industry and farms. The situation is so dire in fact, that existing industry hasn't been able to expand because there isn't enough water, and new industries have looked at the area and left because of the dwindling resource. Schools and hospitals have closed, and young people have left northwest Missouri in search of jobs.

Fortunately, the Water Partnership for Northwest Missouri is addressing this problem head on.

This important workgroup formed to serve as a leader in meeting these challenges. This partnership is promoting collaboration among citizens, local water suppliers, community leaders and the Missouri Department of Natural Resources and other state agencies to address this problem proactively, before it becomes a full-blown crisis.

Developing a solution also will require accurate and thorough data, which the workgroup is working to collect. Understanding the 12-county area's current and future water needs, methods of water treatment and water distribution systems will help to ensure that sound decisions are made.

Northwest Missouri residents deserve an affordable, abundant water supply for the region and its future growth and prosperity. Working together to develop a regional plan to provide every citizen of northwest Missouri with clean, abundant water is necessary to have a thriving community. The synergy this team is bringing to the effort will be critical to maintaining an adequate water supply to support northwest Missouri, now and in the future.

and southwest portions of the state. These conditions have resulted in below normal hay, pasture (about 50 percent of normal growth) and depleted water resources above and below the ground.

Radionuclides

Community water systems are required to test for radionuclides. A running annual average of quarterly samples is used to determine system compliance. The most common sources of radionuclides in groundwater are naturally occurring radioactive minerals in subsurface rock formations, generally due to uranium and radium deposits. Water from wells drilled into such rock formations may contain radionuclides, which are soluble in water. Radionuclides exist in groundwater across Missouri. In some areas they exceed drinking water standards for radioactivity.

Reduced monitoring is allowed for systems with very low contaminant levels. In an effort to protect public health, the water systems are required to test the water at the point where it enters the distribution system. About one percent of Missouri's community water systems have exceeded the maximum contaminant level for radionuclides. The department is working with these systems to bring them back into compliance.

Radionuclides in public water systems are a health concern in humans. Some people who drink water containing radionuclides in excess of the standard over many years may have an increased cancer risk.

Lead

Lead is unusual among drinking water contaminants in that it seldom occurs naturally in water supply wells. In most systems, lead enters drinking water primarily as a result of the corrosion, or wearing away, of materials containing lead in the water distribution system and plumbing. These materials include lead-based solder used to join

copper pipe, brass and chrome plated brass faucets, and in some cases, pipes made of lead that connect a house to the water main (service lines). In 1986, Congress required the use of only "lead-free" plumbing fixtures. Missouri is fortunate to have water that is not particularly corrosive to leaded materials. Most recent data indicates only one system violating the standard for lead.

Missouri River

The Missouri River provides nearly half of the state's drinking water, cooling

ing. This stored water was authorized to be held in storage to support downstream uses during drought.

Depletion of water is a growing issue on the Missouri River. The Bureau of Reclamation recently estimated depletions have increased to 18.4 Million acre-feet of water per year (MAF/yr). This is approximately 29 percent of the average volume of water in the Missouri River that flows past Hermann each year. The department continues to oppose additional depletions such as North Dakota's Garrison Diversion, a massive water



water for producing electricity, shipment of goods, recreation, and tourism. The U.S. Army Corps of Engineers operates the six Missouri River Mainstem Reservoirs located in the Dakotas and Montana. In 2004, it revised its operations manual to retain more water in these reservoirs. Still, upstream states continue to press for more water.

2006 was the Missouri River basin's seventh year of drought. To retain water in the reservoirs the navigation season was shortened by 44 days, impacting shipments of fall harvest on both the Missouri and Mississippi rivers. Low reservoir releases and dry downstream conditions resulted in 11 new daily low flow records at Kansas City during July alone. Although the reservoirs also set new record lows, there is still over 40 percent of the drought storage remain-

project that could divert approximately 1 MAF/yr from the Missouri basin.

Evaluating Missouri's Wetland Resources

The department's Water Resources Center investigates methods and collects data that aid in the management, restoration and protection of wetlands. Three studies funded by the U.S. EPA are in progress and focus on establishing a current dollar value for wetlands, assessing wetland mitigation efforts in Missouri, and locating headwater wetlands with the potential to improve water quality in agricultural areas. Study results will be used to develop strategies for wetland mitigation banking and water quality improvement, and will help to minimize wetlands losses and evaluate compensatory mitigation.



John Reece

Photo courtesy Little Blue Valley Sewer District

Executive Director Helps Sewer District Keep Pace With Growth

It's a fact of life: Every time we flush, it has to go somewhere. Many of us take for granted that the wastes we flush down the toilet or wash down the drain will be safely processed in a manner that will protect both public health and the environment. People like John Reece help make sure that happens.

As Missouri's communities grow, wastewater treatment demands grow as well, leaving many utilities struggling to keep up. As executive director of the Little Blue Valley Sewer District, located in eastern Jackson County, Reece has worked to update the district's services to ensure that it's able to support a population of 300,000 in 10 communities and portions of two counties, while also protecting the Little Blue and Missouri rivers.

The Little Blue Valley Sewer District is a quasi-public agency that conveys and cleans approximately 15 billion gallons of wastewater per year. The district built trunk lines and treatment capacity in advance of

the growth that is now occurring in the Kansas City metro area. These improvements have resulted in better effluent quality, especially during high-flow events like those that occur after a heavy rain.

Reece joined the district as executive director in 2001 because he was intrigued by the challenge it posed. In all, Reece has worked in the wastewater field for 43 years. During that time, he has seen significant changes in the way wastewater is handled.

"When I first started in this field, cities were still dumping raw sewage into our rivers and oceans," Reece said. "All wastewater is now collected and treated; our nation's waterways are cleaner, although there are still many challenges ahead due to more stringent environmental regulations."

In 2003, the district received a nearly \$90 million loan from the State Revolving Fund (SRF) that helped pay for many of the district's recent improvements. The district used the proceeds to pay off a \$6 million interim loan for the planning and design for wastewater treatment plant improvements. The loan also financed additions and modifications at the Atherton wastewater treatment plant, helped improve the telemetry and flow measuring capabilities of the district, and will help rehabilitate and replace portions of the existing conveyance system. The SRF is a joint effort between the Missouri Department of Natural Resources and the U.S. Environmental Protection Agency to provide cost-effective financing for wastewater treatment and collection.

"Reece identified local needs—to protect area water quality—and then worked to develop and implement solutions," said Doyle Childers, director of the Missouri Department of Natural Resources. "Reece has worked with the district to correct problems while also planning for the future of the growing communities the district serves."

Before joining the district, Reece worked internationally to help other countries improve their environment. While with the district, Reece managed the \$71 million project to add capacity and improve effluent quality from the district's Atherton wastewater treatment plant. He says rivers and oceans are better because of his work and that makes his job worthwhile.

CHALLENGES: Protecting Our Water

- Missouri's aging drinking water and wastewater infrastructure serving Missouri's cities and towns are in serious need of improvement or replacement. The cost to meet this need is estimated to be \$11.7 billion over the next 20 years. This need will continue to increase.
- Mercury pollution from power plants both here and abroad, medical and hazardous waste incineration, cement kilns and dental waste, continues to pose a particularly significant threat, making its way into Missouri's rivers and streams. Mercury is a local, regional and global problem.
- Establishing accurate Total Maximum Daily Loads for Missouri's waters is more important than ever. A TMDL is a calculation of the amount of a pollutant or nutrient, if any, a water can receive and still support a wide variety of uses. The TMDL determines the most effective course of action for that water to enable it to once again meet the required water quality standards mandated by federal law.
- Missouri's population continues to increase and development continues to push into rural areas of the state. In addition, parts of the state have been experiencing drought conditions for the past several years. Both water quality and water quantity are going to be significant issues facing the department and the state now and in the coming years.
- It is critical for adequate water flow to be maintained in the Missouri River.

Missouri Energy Resources



Mid-Missouri Energy ethanol plant in Malta Bend

The Missouri Department of Natural Resources has significant responsibilities in the energy arena. The strong relationship between energy use, environmental quality and economic vitality makes the topic of energy a relevant one for the department and for Missouri citizens. The kinds of energy sources we use affect the quality of our air and water. Thus, department staff work to advance the use of cleaner renewable energy resources to diversify Missouri's energy mix beyond traditional fossil energy resources.

These efforts have helped stimulate construction of the first large wind-generation projects in the state and increase the use of ethanol and biodiesel. The department helps ensure that Missourians enjoy adequate energy supplies and works to avoid or minimize disruptions in energy supplies. These actions help secure energy supplies needed to support economic activity in the state. The department also works to

increase the use of energy resources that exist within Missouri. This retains more energy dollars within Missouri's economy, rather than losing these dollars to other states or nations for the purchase of energy sources outside Missouri.

Energy Use

Since nearly 94 percent of Missouri's primary energy sources are imported from outside the state at a cost of more than \$13 billion each year, energy efficiency benefits Missouri's economy by reducing the rate at which dollars leave the state for the purchase of fossil fuels. Energy efficiency also plays a vital role in environmental quality, reducing negative effects to Missouri's air and water by displacing fossil fuel generation. We all can make a commitment to save energy and, just as important, money.

Renewable Energy

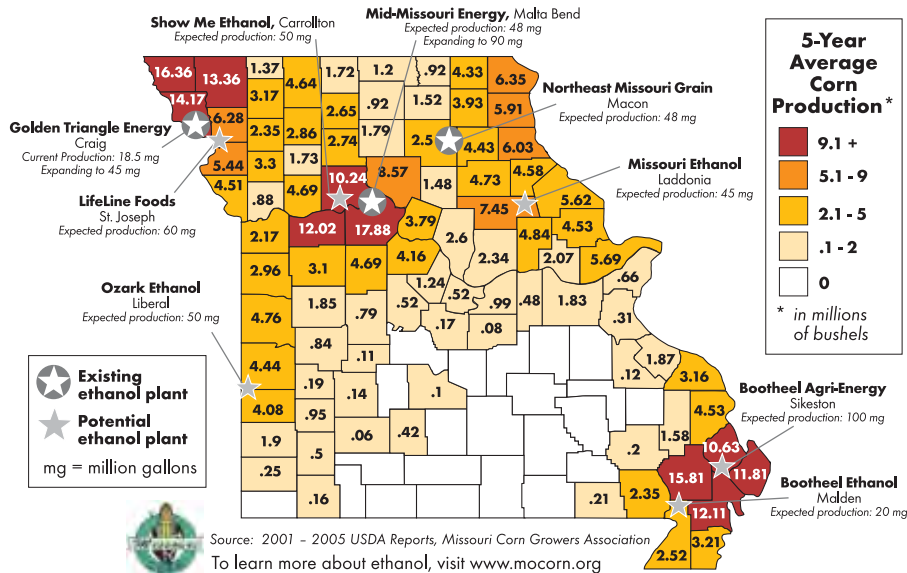
Renewable energy comes in many forms. The potential to increase the use

of solar, biomass and wind resources exists in Missouri and in surrounding states. Biomass is plant matter such as trees, grasses, agricultural crops or other biological material that can be converted to energy. One of the most important aspects of Missouri's solar resource is that it is most abundant when demand for electricity is highest – during the hot summer days when air conditioners place the greatest demand on the electric grid. Missouri benefits from hydropower generated at several locations throughout the state. This renewable source of energy provides a low-cost supply. Although water used to generate power is not consumed, the generation of power is tempered by demand for water by other uses.

Renewable energy holds another allure: the opportunity to help Missouri's economy grow. Every day, Missouri's farms have access to bioenergy, solar and wind energy. New technologies offer the opportunity to harvest

Missouri Corn and Ethanol Production

One bushel of corn equals 2.8 gallons of ethanol



this energy for on-farm use, as well as for sustainable cash crops. Finally, initiatives to develop renewable energy provide us with an opportunity to put to good use products that might otherwise have harmed our environment. Poultry litter, for example, has found its way into our rivers, lakes and streams, where it degrades water quality. Poultry litter is being explored as a potential energy source. To help cooperatives and municipal electric companies assess biomass as an energy source, the Energy Center and partners have developed a computer model to assist with preliminary feasibility analyses.

The Future of Energy Use in Missouri

Many states have adopted policies to encourage the use of renewable energy and investments in energy efficiency to achieve the resulting environmental, economic and security benefits to the general public.

In Missouri, Gov. Blunt established an Energy Task Force by executive

Ethanol Production Capacity For States in Our Region

Iowa	2,364 MGY
Nebraska	635 MGY
Kansas	223 MGY
Missouri	163 MGY

MGY = million gallons per year

The ethanol plants at Macon, Malta Bend, Craig and Laddonia will bring Missouri's ethanol production capacity to 163 MGY. The operation of these four plants will maintain 2,784 Missouri jobs annually while providing \$92 million in Missouri employment income. The completion of all existing plants, expansions and new facilities would bring Missouri to a more than 500 MGY production level and will annually maintain 5,613 Missouri jobs while providing \$182 million in Missouri employment income.

Northeast Missouri Grain in Macon



order in December 2005 to identify and recommend energy policies. The director of the Department of Natural Resources was appointed as a member. The Task Force provided specific recommendations to lessen Missouri's dependence on oil and other fossil fuels; assist low-income Missourians needing help with high energy bills; promote new opportunities for the use of renewable fuels; and encourage Missouri utilities to develop and operate electric power generation resources that will result in low-cost electricity in the future. It issued its action plan in August 2006.

To decrease Missouri's dependence on oil and other fossil fuels, while also strengthening Missouri's rural farm economy, the Task Force made several recommendations to promote the use of alternative fuels. Action items within this portion of the plan included removing regulatory obstacles for renewable fuels and considering lowering taxes on alternative fuels that have a lower British thermal unit (Btu) output than gasoline in order to achieve tax parity for fuels such as E85. It also calls for the expansion of the Missouri Ethanol and Other Renewable Fuels Sources Commission and for the broadening of its duties.

The second front in the effort to decrease the state's oil and fossil fuel dependence involves increased energy conservation. The plan calls for the department's Energy Center to develop and promote a Missouri Energy Efficiency Code; encourage the use of the department's energy curriculum in public schools; and work with construction training programs, and builders and designers to promote and improve energy efficiency and weatherization.

The Task Force made several recommendations to provide assistance to low-income Missourians. Those included support for adequate energy assistance and weatherization assistance funding from federal and state sources; and transfer of up to 10 percent of federal energy assistance funding to be used for weatherization. The plan also calls for the department to study the long-term impacts of weatherization on recipients' future energy and aid needs.

In 2006, Governor Blunt directed that \$2 million from a supplemental federal award to Missouri for low-income energy assistance payments be used to weatherize Missouri homes, providing long-term benefits by reducing energy bills through energy efficiency.

In the past three years there have been significant advances in efforts to harness the wind-energy potential of Missouri. The department's Energy Center initiated an updated assessment of Missouri's wind resources, the results of which have helped spur business decisions to locate utility-scale wind development in Missouri. In 2006, three wind projects were announced – located in Gentry, Atchison and Nodaway counties – that will provide 150 megawatts of electricity for Missouri citizens and businesses through the Associated Electric Cooperative system and for Columbia Water and Light customers. Potential wind developers continue to explore the siting of additional wind farms in Missouri.

The Energy Center is partnering with Missouri utilities and the University of

Missouri-Columbia to install wind-measuring equipment on tall communication towers to gather additional data about Missouri's wind resources. This information will further inform potential investors of utility-scale wind generation turbines.

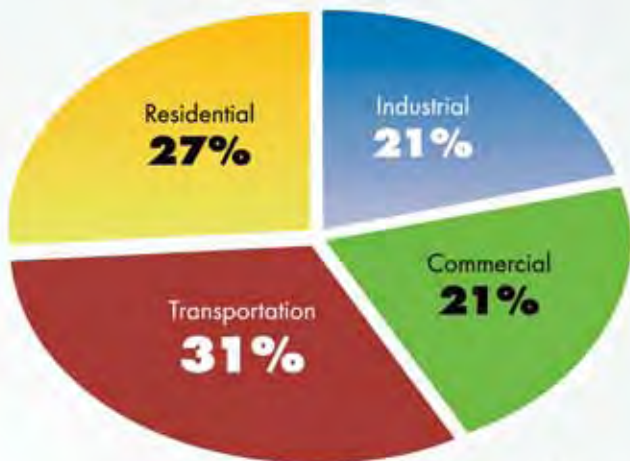
In addition to its involvement in large, utility-scale wind developments, the Energy Center also helps individual landowners determine whether they have sufficient wind speeds to operate smaller wind turbines for on-farm electricity generation.

In recent years Missouri has been active in the development and use of ethanol. During the 2006 legislative session, the Missouri General Assembly passed House Bills 1250 and 1027, which adopted a 10 percent ethanol requirement for all gasoline sold in Missouri beginning Jan. 1, 2008. In 2003, Missouri's ethanol production was approximately 50 million gallons from two plants. In 2005, approximately 118 million gallons of ethanol were produced by three farmer-owned plants in north Missouri (Craig, Macon and



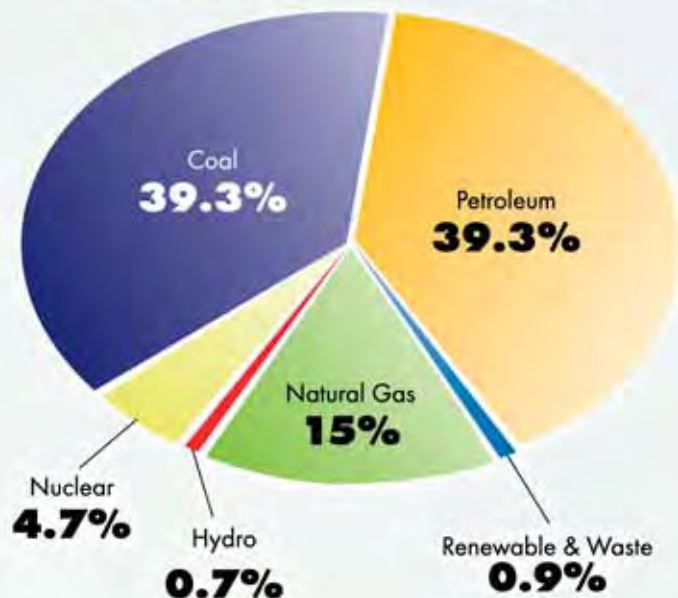
Gov. Matt Blunt speaks near Kirksville in July 2006 at the signing of the Missouri Renewable Fuel Standard Act, which requires most Missouri gasoline to contain at least 10 percent ethanol by Jan. 1, 2008. Blunt is the first Missouri governor to recommend full funding for the Ethanol Incentive Fund. Since taking office, Blunt has directed \$16.5 million to the fund.

Missouri Energy Use by Sector



Source: U.S. Dept. of Energy

Sources of Missouri's Energy



Malta Bend). The state's fourth ethanol plant is planning to begin production in fall 2006 with 45 million gallons of production annually, bringing total production in Missouri to 163 million gallons annually. At least two additional facilities have been proposed that could increase Missouri's total ethanol production to more than 263 million gallons in 2007. This would increase in-state production by more than four times over a five-year period (2003-2007). Construction of the state's first biodiesel production plant also has begun and several additional biodiesel plants have been proposed.

The Energy Center also administers the department's Energy Loan Program. The program currently is helping Missouri school districts and local governments save more than \$70 million in cumulative energy savings. The center has loaned \$75 million statewide since 1988. In 2006, the improvements funded by these loans helped reduce carbon dioxide, or greenhouse gases, in Missouri by more than 17,000 tons.

The Lewis and Clark State Office Building in Jefferson City was awarded a LEED® Platinum certification in 2006. The facility is the Department of Natural Resources' new state headquarters, and utilizes green building technologies. It is the first state office building to be so designated and one of only 16 Platinum facilities nationwide. LEED® stands for Leadership in Energy and Environmental Design. The rating is awarded by the U.S. Green Building Council.



Challenges: Improving Energy Use

- Missouri's consumption of energy has increased 14 percent from 1992 through 2002.
- Increase Missouri's reliance on renewable fuels such as ethanol and biodiesel.
- Bring innovative and environmentally protective energy production to Missouri.



Clean Air: The Commitment Continues

*P*rotecting and enhancing air quality is a challenging responsibility that requires participation from state and local governments, regulated entities and the general public.

Urbanization, industrial development and the increasing use of motor vehicles has prompted the federal government to mandate states implement stricter emission controls. We judge air quality using the National Ambient (outdoor) Air Quality Standards established by the U.S. Environmental Protection Agency under the federal Clean Air Act. Ozone, fine particles and lead have been the primary pollutants of concern in Missouri. However, greenhouse gases and mercury are two pollutants of growing concern.

Ground-Level Ozone

Naturally occurring ozone in the upper atmosphere protects the earth from the sun's harmful rays. Ground-level ozone is an irritant that damages lung tissue, aggravates heart and respiratory disease and can even cause problems for healthy individuals who spend a lot of time outdoors. It is also harmful

to plants and trees. This pollutant is the most harmful part of what we sometimes call "smog."

Ozone is not directly emitted. It forms on hot, stagnant summer days as sunlight causes a reaction between nitrogen oxides and volatile organic compounds. Vehicles, power plants and industrial boilers are common sources of nitrogen oxides. Gasoline-powered vehicles and manufacturing operations are major sources of volatile organic compounds that create ozone.

In Missouri, Kansas City and St. Louis face the greatest threat from ground-level ozone. Both communities have worked diligently to correct this problem. Kansas City is designated as a "maintenance area" due to previous violations of the federal ozone standard. They currently comply with the eight-hour ozone standard, which is based on a three-year average of monitoring data. The Kansas City area will have contingency control measures that can be put into place in the event the area violates the ozone standards. These conditions will be included in a "maintenance plan." Local governments, industry and

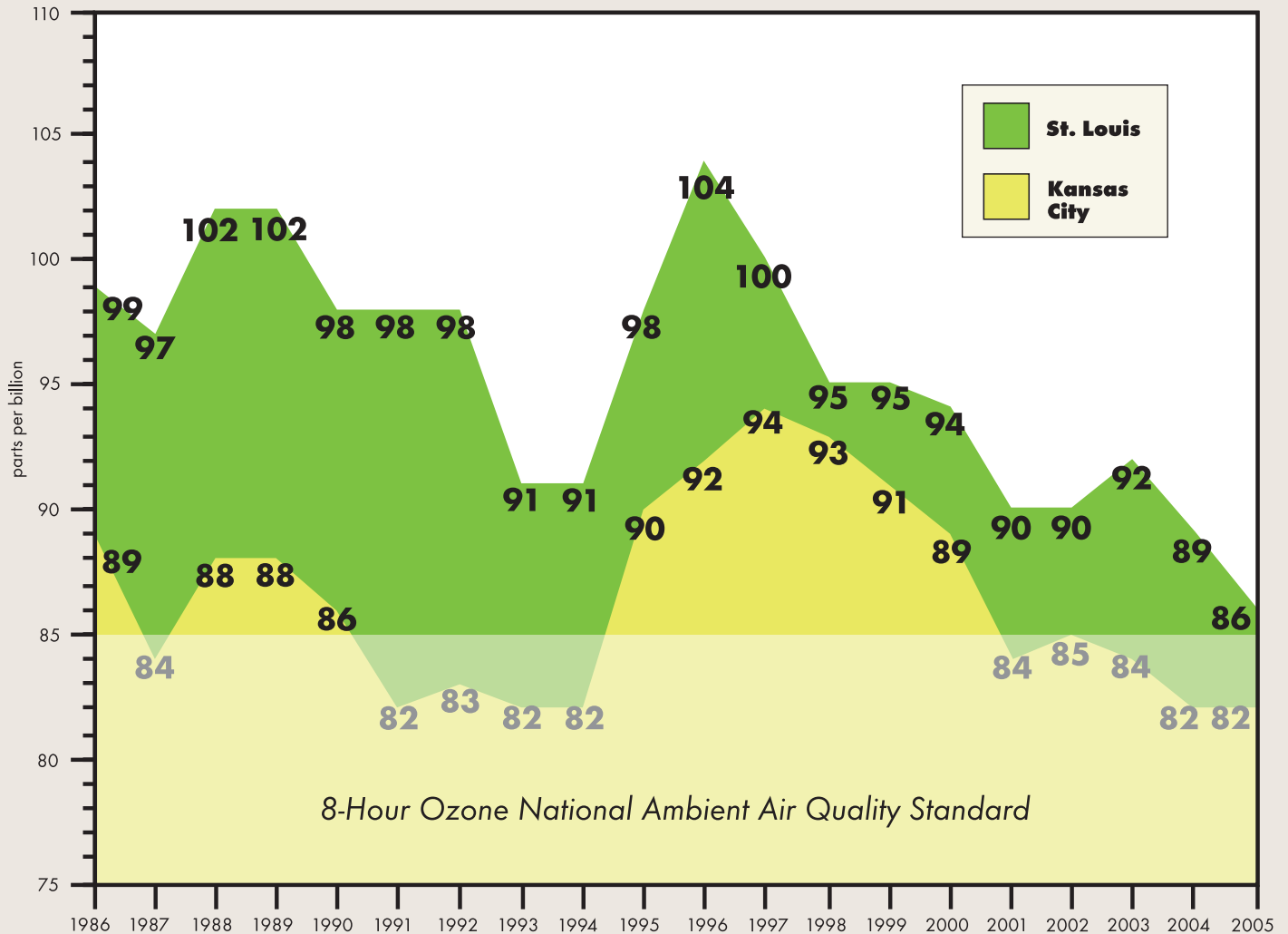
citizens will have opportunities to voice their opinions on the plan.

The Kansas City community is also working on a plan to implement voluntary efforts to reduce pollution, known as the Clean Air Action Plan. These voluntary efforts include industries using best management practices, drivers refueling later in the evening, homeowners and businesses delaying lawn maintenance, and using mass transportation at a reduced cost on high ozone days.

The St. Louis region is currently in violation of the ground level ozone standard. Emissions of ozone precursors – volatile organic compounds and nitrogen oxides – continue to decline. Reformulated gasoline, gasoline vapor recovery nozzles, solvent cleaning and other industrial regulations, and the mandatory inspection and maintenance of automobiles in the St. Louis area have helped to reduce emissions.

While these emission reduction strategies have been effective in St. Louis, additional controls will need to be implemented to bring St. Louis into compliance. The department is develop-

8-hour Ozone Values



The plotted values represent an average of three consecutive years of ozone monitoring data for air quality monitors in St. Louis and Kansas City. The air quality monitor with the highest averaged value sets the ozone value for the entire area. If that value exceeds 85 parts per billion, a violation of the 8-hour ozone standard occurs. The area ozone values are plotted on the last year of the three-year period.

The graph shows that despite occasional increases, there is a steady downward trend of ozone values in St. Louis. The St. Louis area has made great progress toward achieving the standard, but is still just above it at 86 parts per billion. With continued efforts in controlling local emissions, it may attain the standard in the near future. Kansas City has been in attainment for several years. Ongoing levels close to the standard and higher values sampled in 2006 indicate the continued need for careful observation of Kansas City air quality trends.

ing a St. Louis Ozone State Implementation Plan that projects Missouri will meet the ozone standard in 2010 with controls that are already on the books and controls that will soon be implemented.

Vehicle Inspection and Maintenance Redesigned

The 2006 Missouri General Assembly passed Senate Bill 583 changing the current centralized vehicle

emissions inspection and maintenance program in St. Louis. This legislation will create a decentralized program run by local, small businesses rather than a centralized program run by one contractor. This will allow vehicle safety inspection stations and other entities to conduct biennial emissions inspections in conjunction with biennial safety inspections if they are licensed by the Missouri Air Conservation Commission. The decentralized program for the city

of St. Louis, St. Louis, St. Charles, Jefferson, and Franklin counties will go into effect on Sept. 4, 2007. The new program will only conduct on-board diagnostic testing on 1996 and newer light duty (under 8,501 pounds gross vehicle weight rating) gas vehicles and 1997 and newer light duty diesel vehicles in the four counties and St. Louis.

Motor vehicles manufactured before 1996 will require a gas cap pressure test and a visual inspection of its emission

control components as part of the motor vehicle safety inspection test.

Process Improvements

The department views permit streamlining as an ongoing process. For air pollution permitting, the newest mechanism for achieving process improvements has been the Air Program Advisory Forum. Initially instituted in 1997, the forum was reinvigorated in 2003 with a new format. The external forum participants continue to provide most agenda topics, thereby helping the department address the stakeholders' highest priorities and most pressing problems. The focus has shifted away from just permitting. Virtually any topic put forth by a participant is "put on the table" for discussion. This has led to greatly enhanced communication with the people we serve.

Continued Lead Monitoring in Missouri

In Missouri, airborne lead and its compounds come primarily from lead smelters. Airborne lead poses the greatest danger to children age six and under. The federal air quality standard for lead was established to protect public health. Low doses damage the central nervous system of children and unborn infants, causing seizures, mental retardation and behavioral disorders. In children and adults, increased blood-lead levels also cause fatigue, disturbed sleep, decreased fitness and damage to kidneys and blood-forming organs.

Herculaneum, Mo. is the home to the only currently operating primary lead smelter in the country. The department collects daily samples from air monitors in Herculaneum. The federal air quality standard for lead is based on an average over a calendar quarter. While there were no violations of the lead standard recorded from July 2002 to December 2004, the department has since recorded violations in 2005 and 2006. Therefore, the department is revising the state's current plan to bring the area back into attainment of the lead standard. The U. S. Environmental Protection Agency is also reviewing the National Ambient Air Quality Standard for lead by considering recent academic studies

to ensure that the standard is protective of public health. Recontamination of yard soils near the smelter that had been replaced in recent years is also an issue of special concern.

Regional Control Efforts for Air Pollutants

On May 12, 2005, the U.S. Environmental Protection Agency (EPA) published the Clean Air Interstate Rule (CAIR), a rulemaking that will ensure that all Americans continue to breathe cleaner air by dramatically reducing air pollution that is transported regionally in 28 eastern states. CAIR will permanently cap emissions of sulfur dioxide (SO₂) and nitrogen oxides (NO_x) in the eastern United States. When fully implemented, CAIR will reduce SO₂ emissions in 28 eastern states and the District of Columbia by over 70 percent and NO_x emissions by over 60 percent from 2003 levels.

CAIR will help Missouri meet the federal standard for ozone and fine particles. According to EPA's modeling analyses, the St. Louis area will be able to meet the ozone standard based on CAIR and other planned or implemented control measures. The EPA projects that Missouri will still require additional control measures to meet the federal standard for fine particles.

On May 15, 2005, EPA published the Clean Air Mercury Rule (CAMR). CAMR will build on CAIR to signifi-

cantly reduce emissions from coal-fired power plants, which are the largest remaining sources of mercury emissions in the country. When fully implemented, these rules will reduce utility emissions of mercury from 48 tons a year to 15 tons by 2018, a reduction of nearly 70 percent.

Mercury, SO₂ and NO_x emissions will be addressed simultaneously through CAIR and the CAMR. These rules will protect public health and the environment without interfering with the steady flow of affordable energy for American consumers and businesses.

Greenhouse Gas Awareness and Reductions

Concerns over global warming have made greenhouse gases a more prominent air pollution issue. Combustion processes such as burning coal, diesel fuel, gasoline, natural gas, wood and waste materials have increased emissions of greenhouse gases, such as carbon dioxide. The two largest sources of greenhouse gas emissions are coal combustion at power plants and petroleum combustion by motor vehicles.

The department is participating in a regional effort to make available a Voluntary Midwest Regional or National Greenhouse Gas Registry. The registry would provide a greenhouse gas emissions reporting tool for industries and other entities within the participating states to promote consistency in the way information is gathered.

Missouri is also a member of the

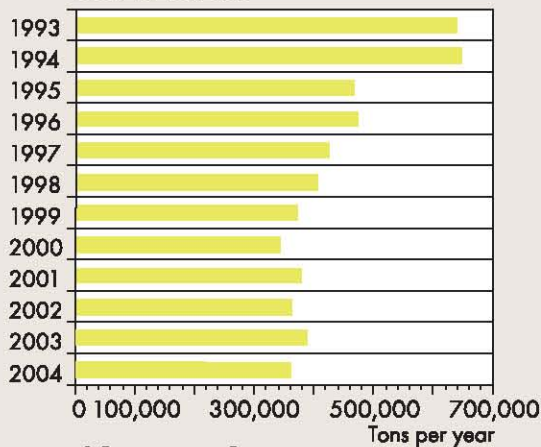
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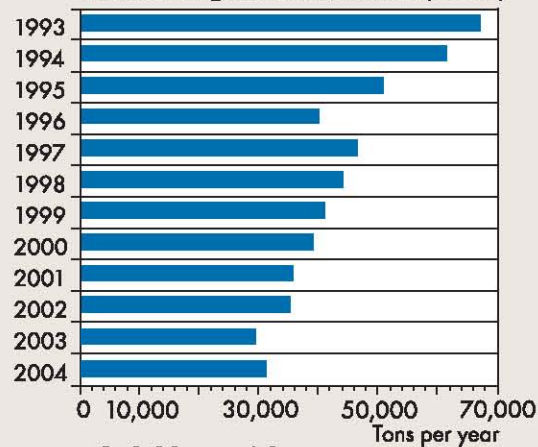
Air monitoring station in Herculaneum

Air Emissions

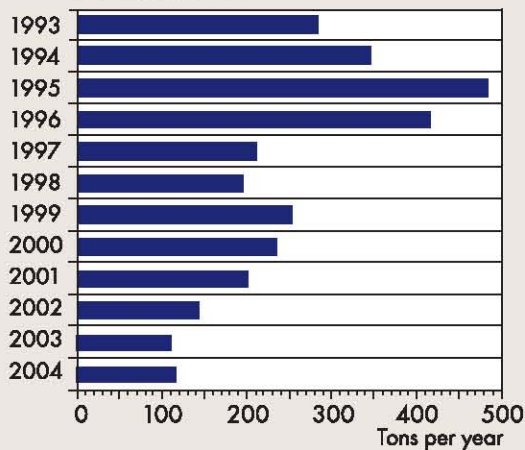
Sulfur Dioxide



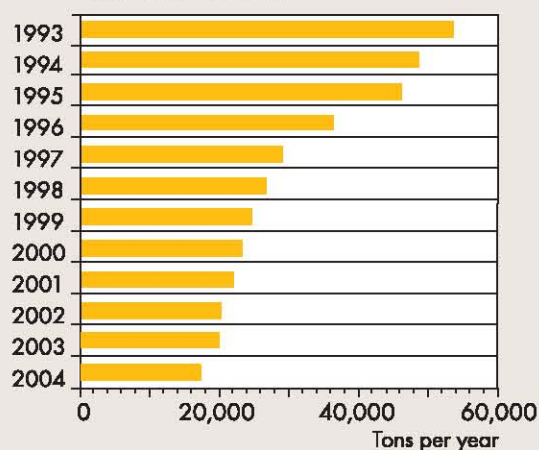
Volatile Organic Compounds (VOCs)



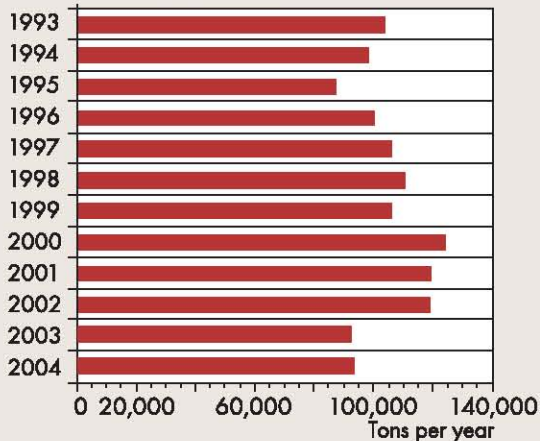
Airborne Lead



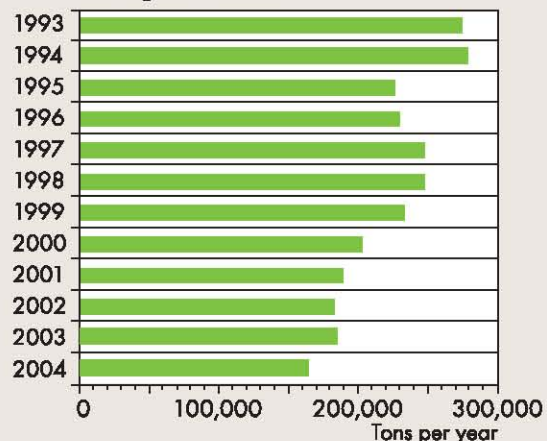
Inhalable Particles



Carbon Monoxide



Nitrogen Dioxide



Sulfur Dioxide - Sulfur oxides are produced by burning sulfur-containing fuels such as coal and oil, by smelting metals and by other industrial processes. Sulfur dioxide (SO₂) makes up about 95 percent of these gases.

Airborne Lead - In Missouri, airborne lead and its compounds are produced mainly by lead smelters.

Carbon Monoxide - Carbon Monoxide (CO) is a colorless, odorless, poisonous gas that forms when carbon in fuels is not burned completely. It is a byproduct of vehicle exhaust.

Volatile Organic Compounds (VOCs) - Volatile organic compounds react with nitrogen dioxide (NO_x) on hot, summer days to form ground-level ozone. Vehicles, power plants and industrial boilers are common sources of nitrogen oxides. Gasoline-powered vehicles are a major source of VOCs.

Inhalable Particles - Inhalable particles include airborne dust, pollen, soot and aerosol sprays. Scientists sometimes refer to these as particulate matter.

Nitrogen Dioxide - Almost all nitrogen dioxide is man-made. If fuel is burned above 1,200 degrees Fahrenheit, airborne nitrogen forms highly reactive nitrogen oxides such as nitrogen dioxide. Principal sources are power plants, industrial boilers and vehicles.

Missouri's Carbon Dioxide Emissions

	1990	1995	2000	2005*	2010*
Electric Utility	51,539	60,243	71,730	72,378	72,751
Transportation	36,782	42,351	47,150	49,821	51,554
Commercial	4,625	4,991	5,329	5,323	5,330
Industrial	10,284	10,497	10,591	11,263	11,710
Residential	8,242	9,073	9,634	9,506	9,515
TOTAL	111,472	127,156	144,434	148,291	150,860

in thousands of tons per year

* Projections calculated using the department's Energy Center Report from 1990.



St. Louis riverfront

Blue Skyways Collaborative, which is helping to identify pollution control options in the central United States. Blue Skyways is a voluntary public-private partnership aimed at reducing

greenhouse gas and air pollution emissions through implementation of projects that use innovations in diesel engines, alternative fuels, and renewable energy technologies. Implementation of

these projects and others like it will reduce fossil fuel emissions and will be a positive step toward reducing greenhouse gas emissions as well.

CHALLENGES: Protecting Our Air

- Missouri is seeing an increase in the building of ethanol and biodiesel plants as the demand for alternative fuels increases. The department is working with the ethanol and biodiesel industry to issue permits to these new facilities as quickly as possible while ensuring compliance with federal and state air quality standards.
- The department continues to monitor ambient lead levels around the Doe Run-Herculaneum lead smelter. The department is revising the state's current plan to ensure that this area achieves attainment of the lead standard. The short time frame to submit this plan to the U.S. EPA will limit the approach the department can take to address the issue.
- Reports of objectionable odors are one of the most frequent complaints the department receives from concerned citizens. Odor is often very difficult to address because it can be difficult to determine its source and may be intermittent in nature.
- After several summers of higher-than-average exceedance days for ozone, it is likely that the Kansas City area will violate the eight-hour ozone standard in 2007. To keep the area in attainment; the department is developing an eight-hour ozone maintenance plan that will include contingency measures to control emissions of ozone precursors in the event that violations occur.
- Improving air quality in St. Louis and Kansas City improves the health of nearly half of Missouri's population.

Our Land:

Maintaining Production; Ensuring Protection



Courtney Ridge Landfill, Sugar Creek

Our land sustains us by producing the fruits, vegetables and grains necessary to nourish our bodies and the timber that provides us shelter. The crops our land produces also are an important source of income for many in Missouri's rural communities. Minerals and rocks contribute to the economy of the state in a variety of ways. Some of these raw materials are key components in construction of roads, bridges, buildings, homes and numerous other products. Limestone products are used in agricultural applications, pharmaceutical products, paper manufacturing, paint, glass making, cement and pollution control technologies.

Damaging our land by soil loss, polluting our soil or improperly disposing of solid and hazardous waste can have far-reaching consequences.

Soil Erosion

About 57 million tons of soil erodes from Missouri's agricultural land put into row crop production each year. Much of that soil enters our waterways, clogging and filling streams, reservoirs and lakes. The severity of flooding is increased as these silt-laden waterways

and reservoirs do not have the capacity to hold as much water. Thinner topsoil also decreases soil productivity. Less production means lost income to the landowner and higher prices for the consumer. Although soil erosion is a natural event, certain traditional farm tilling methods can accelerate erosion. This depletes the soil, requiring more use of fertilizers and pesticides and sometimes even rendering it useless.

Our goal is to have 95 percent of Missouri's agricultural land protected so as to maintain its long-term productivity. This is only one of the many goals provided in the Soil and Water Districts Commission's "Plan for the Future."

Because of its climate topography and soil types, Missouri will continue to address significant erosion problems on acres dedicated to cultivated croplands. Since 1982, Missouri has reduced its rate of soil erosion more than any other state. With funding from the parks-and-soils sales tax, the department's Soil and Water Conservation Program has provided approximately \$413 million in financial incentives through 162,000 claims to landowners for voluntary soil conservation efforts.

Solid Waste

Improper disposal of solid waste can cause health and environmental problems such as groundwater and surface water pollution, air pollution and transmission of disease. To prevent these problems, disposal facilities must meet stringent design, operation and maintenance requirements. Unfortunately, not everyone uses a permitted, engineered facility. Illegal dumping and other violations of the Solid Waste Law sometimes make the enforcement arm of the Missouri Department of Natural Resources necessary.

By reducing, reusing, recycling or composting waste, we can save energy, raw materials and landfill space. The department provides Solid Waste Management Districts grants to promote waste reduction, recycling and proper waste management. Over \$63 million has been used to divert over 1 million tons of material from landfills since the grant program started in 1993. The department also provided grants through the Waste Reduction and Recycling Project program until the law changed in 2005. During fiscal years 1993 to 2005, the department awarded

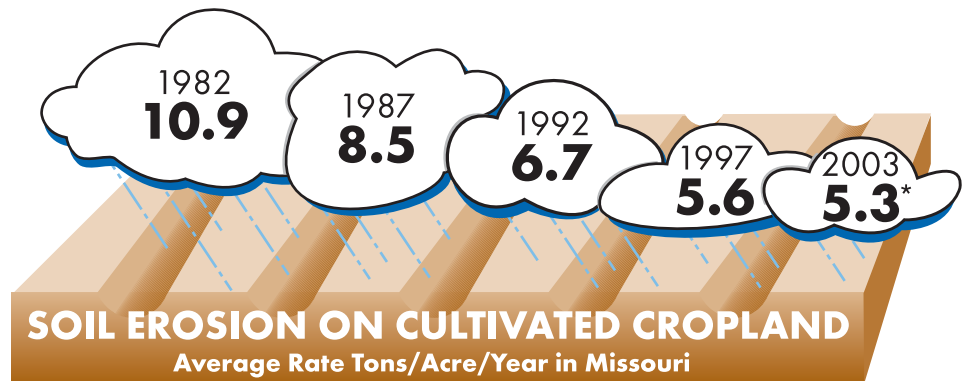
over \$22 million diverting almost 400,000 tons from landfills.

Since 1993, the Environmental Improvement and Energy Resources Authority awarded almost 300 grants totaling more than \$7.5 million for market development and technical assistance projects.

Solid waste disposal alternatives resulted in a 46 percent diversion from landfills. Missouri companies use solid waste resources to create a variety of recycled products.

Missouri has 21 active sanitary landfills accepting municipal solid waste, five utility waste landfills accepting ash from coal-burning power plants, three construction and demolition waste landfills, three special waste landfills and 50 transfer stations. Transfer stations consolidate trash before moving it to a regional landfill. A good portion of Missouri's waste still ends up in landfills. Per capita, each Missourian generates more than one ton of waste per year.

The siting of solid waste facilities such as landfills and transfer stations has become increasingly difficult and controversial. Everyone is able to generate a ton of trash per year but few



*Pre-release estimates based upon the 2003 National Resources Inventory. These estimates are subject to change.

want a landfill or transfer station nearby. As a result, some communities have passed local zoning ordinances prohibiting the siting of these facilities within their borders. Transporting waste long distances due to lack of nearby disposal facilities increases disposal costs for citizens.

Cleaning up Scrap Tires

When scrap tires are not disposed of or recycled properly they pose serious threats to human health and the envi-

ronment. Tire fires can burn for months and release hazardous substances into the air and possibly into surface and groundwater sources.

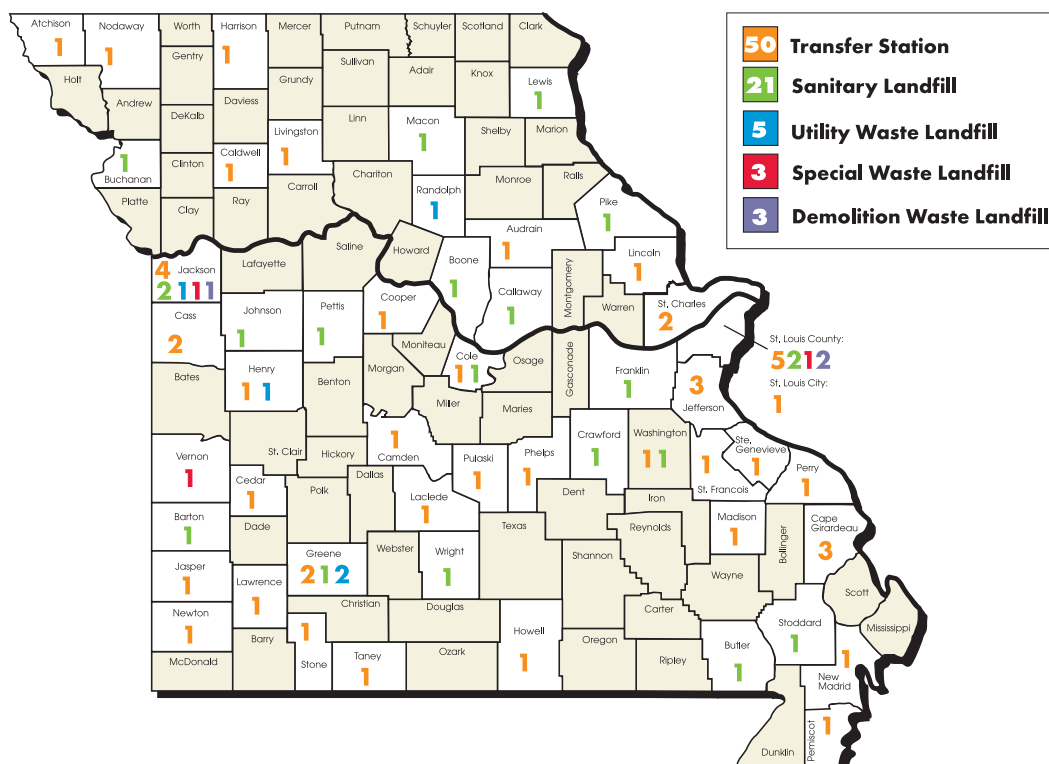
Since 1994, nearly 14 million tires from more than 600 illegal dumpsites have been cleaned up in Missouri. The department recently celebrated the beginning of a cleanup at what is known as the Bishop Tire Site in Cass County. It was the largest remaining tire site in the state, containing more than one million tires. The cleanup contractor will shred the tires and reuse them as leachate collection media in a landfill.

The department estimates that after this site is cleaned up, there are still 500,000 scrap tires in Missouri dumpsites, and potentially another one million tires yet to be discovered.

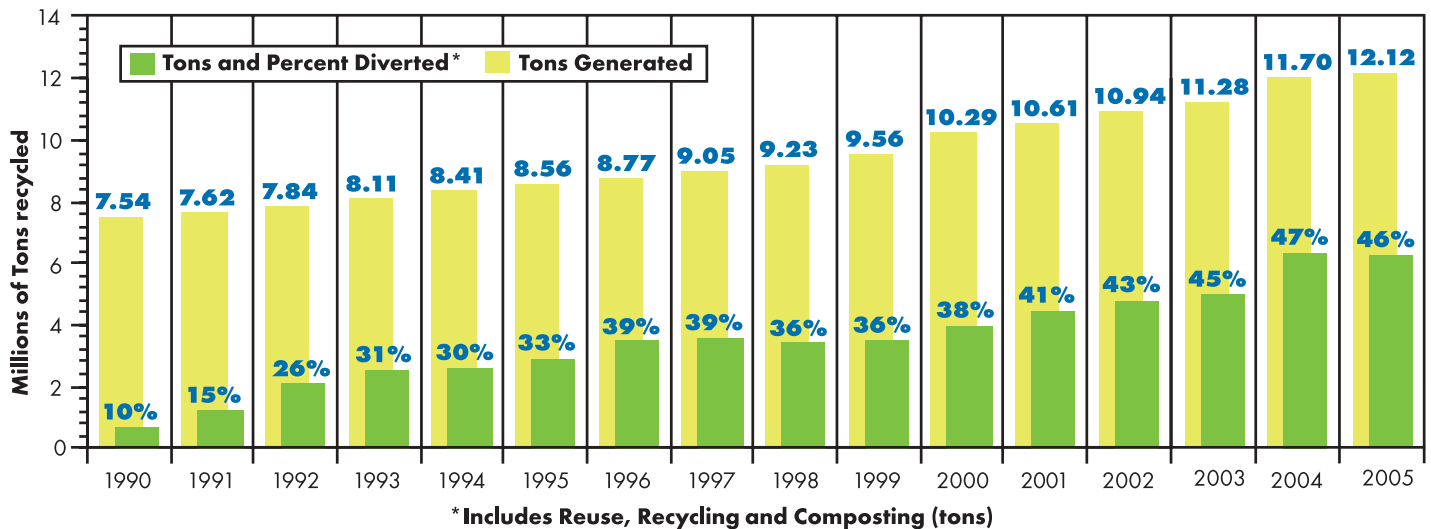
Water standing in scrap tires provides an ideal breeding ground for mosquitoes, which are known to carry diseases such as the West Nile Virus. In 2004 and 2005, there were 66 reported cases of West Nile Virus in Missouri.

Tire cleanups are funded by the Scrap Tire Fee, in which vehicle owners pay 50 cents for any new tire purchased in Missouri. The fee generates about \$2.1 million annually and helps the department

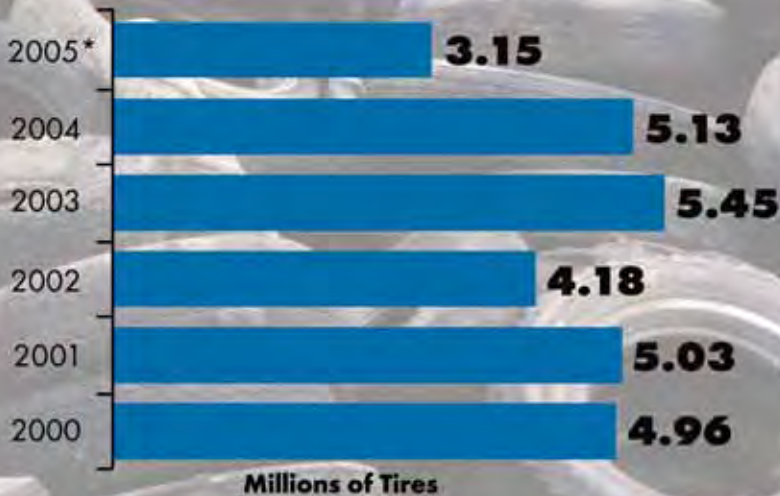
Missouri Landfills and Transfer Stations



Waste Generated and Waste Diverted From Missouri Landfills



Cleaning Up Scrap Tires Number of Tires in Missouri Used for Fuel



* A substantial 2005 decrease in the creation of tire-derived fuel (TDF) was due to an expansion of the Ameren-UE Portage Des Sioux plant. Ameren's expansion utilized the area where tires were stored, so they quit creating TDF in May 2005. The Department of Natural Resources currently is working with the Missouri Department of Transportation to promote the use of scrap tires in asphalt for Missouri's roadways, and recover some of the market for TDF.

oversee and support scrap tire cleanup efforts. The fee expired on Jan.1, 2004, and was reinstated with the passage of Senate Bill 225 during the 2005 legislative session.

When recycled properly, scrap tires have other beneficial uses. They can be made into playground surfaces, running tracks, recycled rubber products and can even be burned for fuel in power plants. In 2004 and 2005, more than 8 million tires were used as tire-derived-fuel in power plants. The department is also working with the Missouri Department of Transportation to promote the use of scrap tires in asphalt produced for Missouri road projects.

So a tire that was once a home for mosquitoes and other pests could become a belt or purse, protect a toddler from a nasty spill, or even help to light your home.

Hazardous Waste

Hazardous waste is just about everywhere, even places you might not think of as you go about your daily activities. The corner gas station may have tanks that are leaking. The dry cleaners you take your clothes to may have used chemicals that have seeped into the soil. The beautiful historic building down the street may contain lead paint or asbestos materials.

There are numerous ways the department has continued to move forward with the ultimate goal of providing assistance in the cleanup of hazardous materials and in the prevention of

chemical and petroleum releases. Through partnerships with local, state and federal groups the department collaborates on many projects that have cleaned up the land and helped revitalize communities.

To facilitate additional site cleanups and protect human health and the environment, the department has created a process called the Missouri Risk-Based Corrective Action Technical Guidance. This guidance gives property owners more flexibility in managing contaminated properties and makes cleanups potentially less expensive.

Nationwide, electronic scrap (E-scrap) is a growing problem. Currently, E-scrap makes up between one to four percent of the waste stream, according to the EPA. Hazardous materials, lead, mercury, cadmium and other chemicals found in color computer monitors, televisions and other electronic equipment are sitting in our landfills. The department partnered with several manufacturers, vendors, recyclers, environmental groups, waste haulers and processors, several Missouri state agencies, federal agencies, local governments, and other interested parties to form an E-scrap Stakeholder Workgroup. That workgroup is creating a plan for disposing, reusing and recycling electronic scrap in Missouri in an economically sustainable fashion without threatening the environment. The workgroup has defined E-scrap in Missouri as any unwanted TVs, computer monitors, computers, and peripheral devices.

Senate Bill 225, which passed during the 2005 legislative session, assessed a fifty-cent fee on all batteries sold at retail that are six volts or higher. The fee is in effect until 2011. The department will use proceeds in its effort toward pollution prevention as well as oversight of all generation, storage, transportation and disposal of hazardous waste in Missouri.

The department continues to provide easy access to relevant information and documents related to hazardous waste both online and in paper form.

Brownfields

The Brownfields/Voluntary Cleanup Program addresses and handles brownfields cleanup and redevelopment for the department. Many of the sites entering the program are not heavily polluted, and are contaminated by sources not

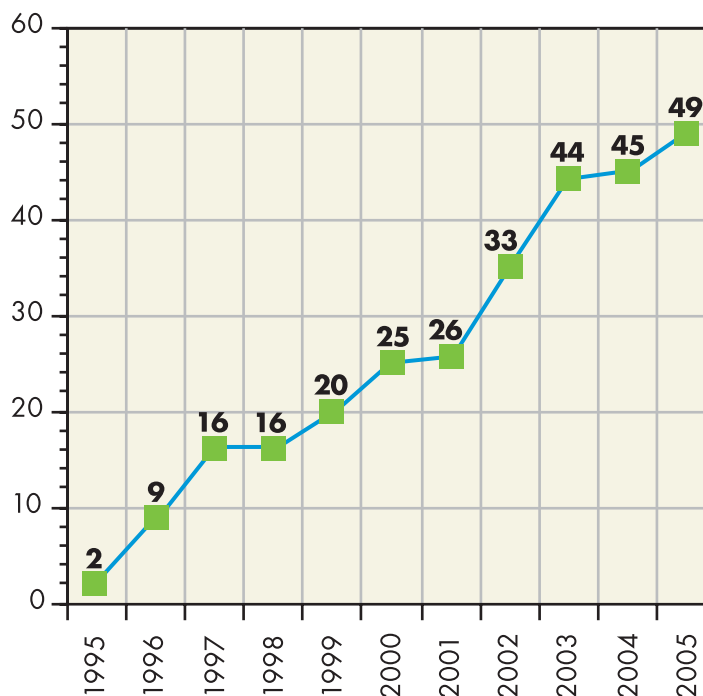
addressed by the department's regulatory programs.

The property owners, business operators, or prospective buyers want the property cleaned up to standards acceptable to the state and to receive some type of certification of the cleanup from the department. This certification can

greatly reduce the environmental liability associated with such properties, increase the property value, and allow unused or blighted properties to return to productive use. In Missouri, 211 brownfield sites are currently undergoing cleanup. To date, 285 sites have been cleaned up and returned to produc-

Brownfields/Voluntary Cleanup Program

Completions by Calendar Year 1995-2005



Long-Term Stewardship – Coming Full Circle at Weldon Spring

In April 2006, the Missouri Department of Natural Resources, in coordination with the U.S. Environmental Protection Agency and the U.S. Department of Energy, hosted an event to commemorate the start of long-term care of the Weldon Spring site.

The celebration focused on the successful coordination among the U.S. Department of Energy, the U.S. Environmental Protection Agency, the Missouri Department of Natural Resources and the Missouri Department of Conservation. Cooperation among these agencies has spanned more than three decades, including the cleanup of the environmental contamination and the integration of the site into its surrounding land use.

The site has been transformed into an education and recreation destination. There is information at the site's interpretive center on the cleanup and current status of monitoring. There are examples all around the area showing the reestablishment of native prairie plants. The Hamburg Hike and Bike Trail (named for one of the towns originally displaced by the federal government), and a viewing platform on top of the disposal cell are also worthwhile experiences to enjoy when you visit the area.

The disposal cell contains hazardous and contaminated waste materials left over from a World War II explosives manufacturing plant. Later, a uranium processing facility on the Weldon Spring site left behind radioactive waste that would also be placed in the cell. Approximately 1.48 million cubic yards of waste have been entombed in the disposal cell.

In October 2006, Gov. Matt Blunt presented a Governor's Award for Quality and Productivity to the Department of Natural Resources, Department of Health and Senior Services and Department of Conservation for their innovation on the Weldon Spring Site Remedial Action Project. The coordination of the project led to innovative solutions that included the cleanup of radioactive and hazardous wastes using engineering technologies and stewardship components. The result includes a site that is not only protective for our citizens and environment, but also has an ongoing mission of education and recreation.



Weldon Spring radioactive waste disposal cell

program for underground storage tanks. Missouri now has programs in place that register these tanks and oversee the cleanup of ones that leak.

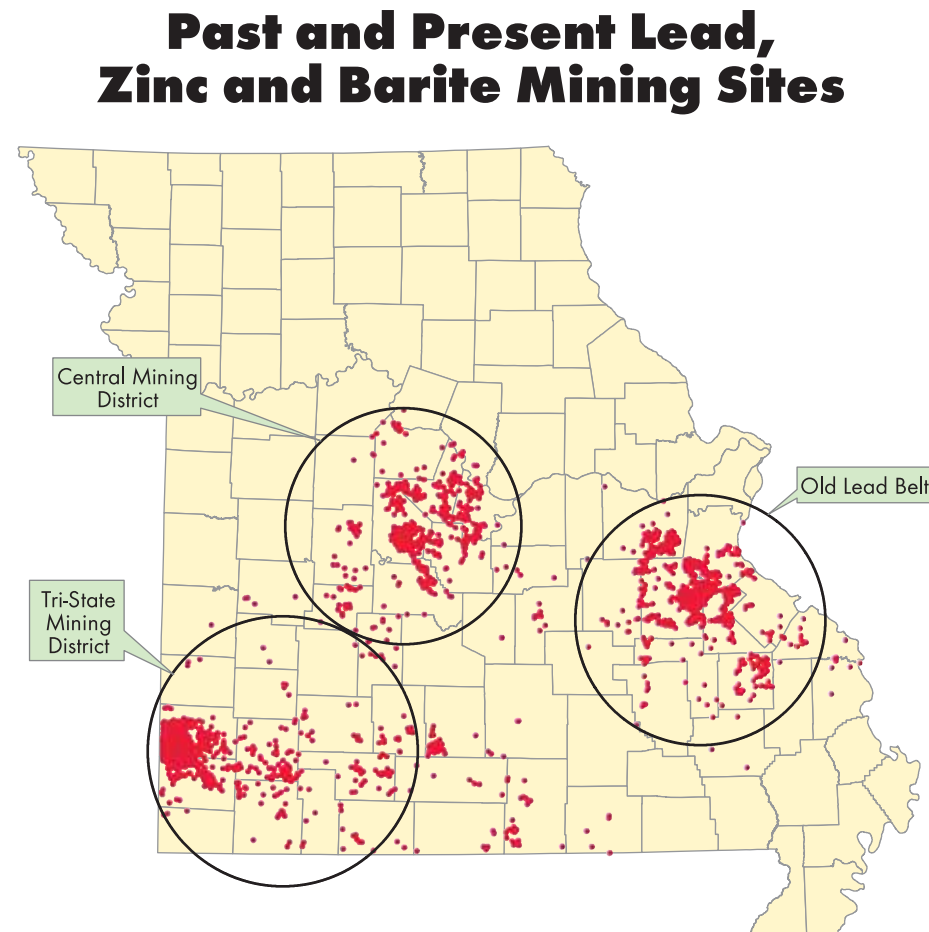
Cleanup guidance provides great flexibility and many tools for tank owners to clean up sites in accordance with the reasonably anticipated future use of the property. The guidance document streamlines the cleanup process as we continue to improve it.

The Missouri Petroleum Storage Tank Insurance Fund, administered by a board of trustees, helps insure owners and operators of underground and above ground petroleum storage tanks so that they will have the financial resources necessary to pay for leaks or spills from their tanks if they occur. The fund insures approximately 10,000 tanks at about 3,300 locations; this is approximately 85 percent of the underground tanks and 20 percent of the above ground tanks where petroleum is stored.

Mining

Imagine a land so barren and without vegetation that it has earned the nickname “moon land.” Because of past mining practices, this has become a reality in many parts of Missouri. In the past, strip mining allowed acid mine wastes to seep into local bodies of water, resulting in degradation of aquatic habitat and water quality.

Although coal mining in Missouri has decreased in recent years, the need

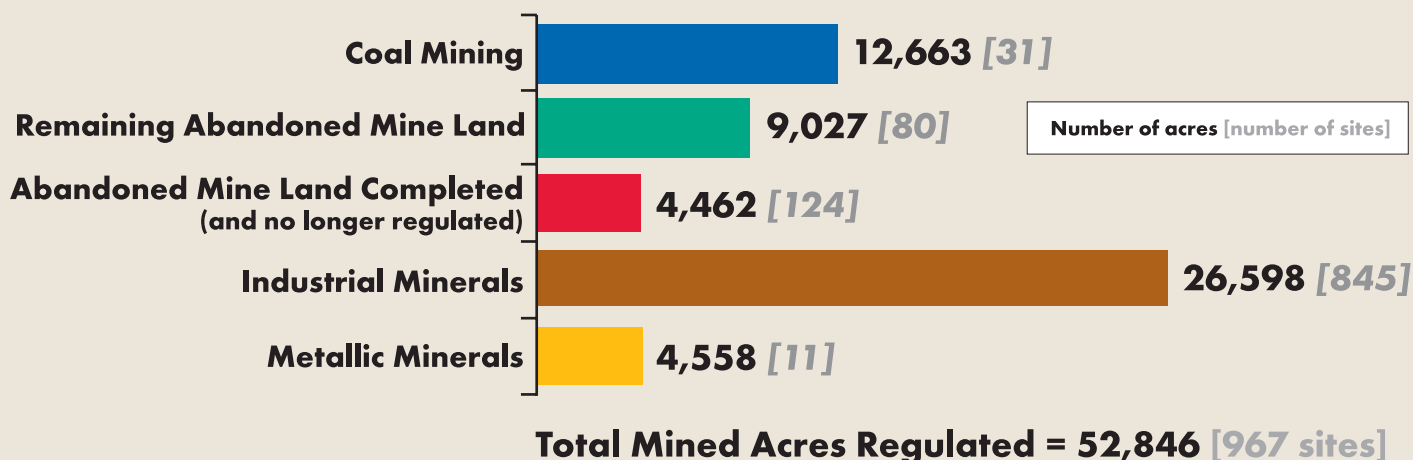


to reclaim any land previously disturbed by strip mining remains. Businesses and communities have worked diligently with the department to clean up these mines. In fact, 99,690 cumulative acres will have been returned to productive

use by the year 2006.

The department also handles permits, complaints and enforcement for 856 metallic and industrial mineral sites and manages the reclamation of abandoned and inactive coal mine sites.

Acreage of Mining Sites Regulated in Missouri Fiscal Year 2006



Powerful Tool Aids In Planning Process

It is often said that information is power, and the second edition of the Missouri Environmental Geology Atlas CD-ROM, or MEGA 2007, puts a significant amount of power at users' fingertips.

The MEGA 2007 CD-ROM is a collection of interactive computer maps that allows access to more than 30 statewide Geographic Information System (GIS) data layers from computer desktops. Significant improvements and additions have been made since MEGA's debut in 2003. New data layers have been added and many of the existing data layers updated.

Because the state has been collecting geologic data since the mid-1800s, vast amounts of data are available.

Landowners, developers, engineers, geologists, planners, consultants, first responders, researchers, teachers and students will find this tool particularly helpful.

Rick Elgin, a licensed geologist with Midwest Environmental Consultants in Jefferson City, often uses MEGA to preliminarily identify geologic features. When fuel leaked from an underground tank and contaminated area groundwater wells, Elgin used data from MEGA to identify the area's geologic features and evaluate how the local aquifers were being used. This information helped focus on-site exploration and cleanup efforts in a more cost-effective manner.

"The data in MEGA is one of several tools we use when contacted by clients seeking potential contamination to a site," Elgin said. "We welcome the additional layers offered in MEGA 2007."

Among the additions is a water table map showing uppermost groundwater elevations. Other new data layers include drill areas depicting requirements for well con-

struction. House and Senate district boundaries are also part of the collection. Additional data layers include: bedrock geology, well and spring locations, dye trace data, public land survey system information, geologic structures, sinkhole locations, alluvial floodplains, certified wells, dye traces, surficial materials, stream hydrology and the Public Land Survey System. This CD-ROM also provides public domain information such as streams, lakes, roads, urban areas and county boundaries.

"I think users of the first version of MEGA (2003) will be very impressed with the new data layers and improvements included with this new edition (MEGA 2007)," said Mimi Garstang, state geologist and director of the Department of Natural Resources' Division of Geology and Land Survey. "I am excited about getting more information in the hands of decision-makers across the state. It will help us all do our jobs better."

Herb Turner, a middle school science teacher in Waynesville, appreciates that the program is designed for use by the general public. His students currently are using MEGA to create maps for the city council that will combine recreational use areas with environmental information. "This tool allows us to share so much information with the community," Turner said.

MEGA is not a replacement for on-site investigations.

MEGA 2007 can be purchased for \$45 through the Missouri Department of Natural Resources' Division of Geology and Land Survey. To order a copy, contact the division's publications desk at (573) 368-2125 or 1-800-361-4827, or order online at www.dnr.mo.gov/geology/adm/publications/MapsOrder.htm.

Unfortunately, much work remains but few resources are available to do it. There is no money available, for example, to reclaim old lead mine sites that were created prior to the state's mine site permit system.

Although Missouri lost federal funding for fiscal years 2004 and 2005, the U.S. Interior's Office of Surface Mining restored funds in fiscal year 2006.

Missouri enforces the Missouri Coal Regulatory Program that is a prerequisite to having the Abandoned Mine Lands Program, which funds coal mine cleanups of abandoned mines with fees

paid by coal operators.

Missouri currently has more than 12,000 acres of coal mine land, both active and forfeited, that require monthly inspections. In addition, there are more than 26,000 acres of industrial minerals including rock, gravel and clay quarries, and more than 4,500 acres of metallic minerals waste disposal areas that require less-frequent inspections.

Abandoned lead-zinc and coal mines continue to impair waters decades after mining has ceased. A tax on coal has funded efforts to clean up coal-mined lands nationwide. This tax, collected at

the federal level, is scheduled to expire in 2007 if not renewed. Twenty years of this and other programs in Missouri have reduced the number of stream miles impaired by acid mine drainage from about 100 to 15, but long-term effects most likely will remain. The department's Division of Geology and Land Survey is conducting an inventory of several thousand lead, zinc and barite mines to assist in prioritizing future sites for mined-land cleanups.

In an early journal entry, explorer William Clark described one of Missouri's most abundant natural



Land Survey work at the Taum Sauk Reservoir breach
DNR file photo



resources, limestone. Although we may pay little attention to the limestone quarry we pass alongside the highway, we depend on products derived from that quarry in our everyday lives. These raw materials are key components in construction of roads, bridges, buildings, homes and numerous other products that are essential to our way of life.

Development of Missouri's abundant supply of limestone is just one example of the important role geology plays in our state's economy. The Department of Natural Resources produces and disseminates geologic and hydrologic

information to be used for environmental and human health safety decisions.

Geologic and hydrologic information can be used to predict earthquake risk, sinkhole collapse, sites where landslide may occur, areas where a limestone quarry could be developed, places where wells could be drilled to meet specific needs and where a landfill could be safely located. Some of the most widely-used information includes the ever-growing collection of geologic maps depicting surficial material and bedrock geology.

A national study determined that the value of this type of data exceeds the cost of developing the data by 25 times. From an economic perspective, Missouri must continue to produce and provide this information in a format usable by all types of decision-makers to protect citizens, assist developers and protect the environment.

Electronic databases created and maintained by the department are readily available to the public. This information is routinely used in the siting, monitoring and cleanup of all types of waste sites throughout the state.

Land Survey Work at the Taum Sauk Reservoir Breach

In the aftermath of the Taum Sauk Reservoir Breach, a metal disk set in the ground, previously established in 1996 by state surveyors from the Department of Natural Resources' Land Survey Program, proved to be invaluable

able to the department and its partners. This Geographic Reference System monument at the entrance of Johnson's Shut-Ins State Park is a surveyed location of known elevation, latitude, longitude and state plane coordinates.

When the U.S. Geological Survey (USGS) enlisted the help of state land surveyors, the ability to use the previously established control point made it possible to collect very accurate survey information. The USGS plans to use survey information, combined with other technology and aerial photography to determine the effects of the debris flow and inundation caused by the breach. This survey work will aid in the study of the impact of flood water at the state park and the East Fork of the Black River.

Sinkhole Collapses

The destruction of a home in Nixa in August 2006, as a result of a sinkhole collapse, is a rare occurrence. More frequently, sinkhole collapses adversely impact a lake or pond, occurring where the bedrock is composed of limestone or dolomite. Collapses also occur due to storm sewers, cisterns, underground mines or other long-forgotten manmade voids that settle over time.

State environmental geologists assisted the city of Nixa in assessing the risk to nearby residents and in stabilizing the situation. Geologic maps compiled and produced by state geologists aid environmental geologists, city planners, landowners and decision-makers in determining the best location for development as well as for mitigating these hazards.

The department's Division of Geology and Land Survey regularly assists citizens seeking advice concerning collapses on their property.

As a result of publicity about the Nixa collapse, the department received many inquiries from individuals wanting information about known sinkholes. Geologists used a statewide sinkhole Geographic Information System coverage and database developed at the department's Division of Geology and Land Survey to inform citizens about the locations of known sinkholes and potential for karst collapse in relation to their homes.

In February 2005, department geologists assisted a landowner and the Barry County government by completing a

**Geographic Reference System
survey marker**
DNR file photo



Nixa sinkhole

Photo courtesy Springfield News-Leader



preliminary study of a sinkhole area that appeared in a field near Exeter. The Barry County sinkhole grew to the size of a football field.

Dam Safety

The Missouri Department of Natural Resources, through its Water Resources

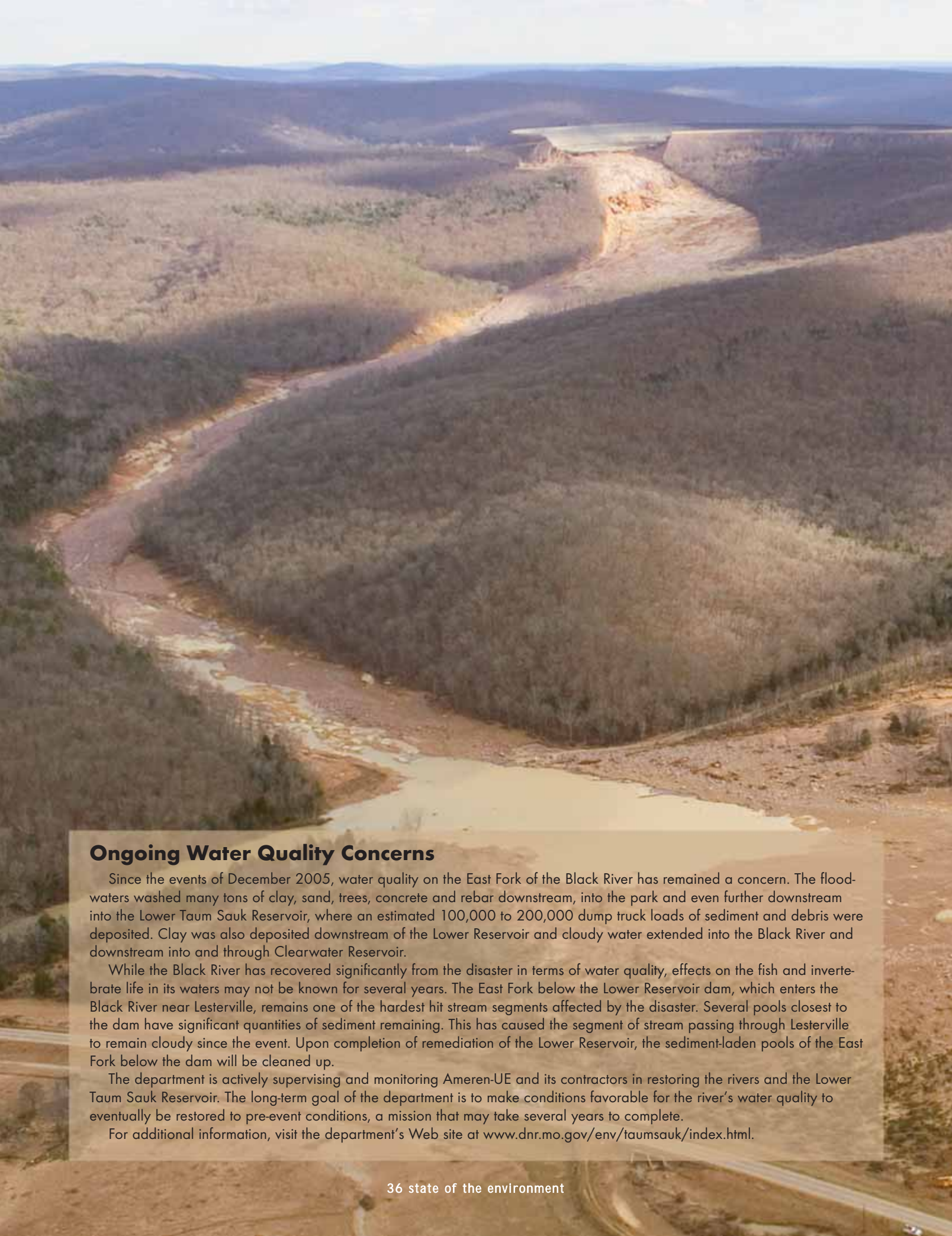
Center, is responsible for ensuring that dams in the state are constructed, maintained and operated in a safe manner. State regulation applies to all non-agricultural, non-federal dams more than 35 feet in height. The department also provides technical assistance and informational resources to assist all dam owners

in the state of Missouri.

Missouri contains approximately 640 regulated dams that must be inspected on a regular basis. The challenge of ensuring that these dams are properly maintained is both an environmental health and safety issue that affects people, property and natural resources.

CHALLENGES: Protecting Our Land

- The department faces significant financial challenges in carrying out its statutory responsibilities to investigate and clean up hazardous waste sites, implement the new federal tank requirements and maintain long-term stewardship of contaminated sites.
- The federal Energy Policy Act of 2005 included new federal requirements for underground storage tanks to continue to reduce the threat of petroleum releases. Implementing the new federal requirements will be a challenge for the department during the next two to five years.
- As the department continues to assist in the cleanup of sites, some contamination may be left in place at safe levels. Long-term stewardship needs to be implemented so that communities, prospective purchasers, lenders, developers, construction workers and the public can ensure that sites remain safe for intended future use, when contamination remains.
- Many areas of the state have lead contamination from past lead mining activities. This has resulted in widespread lead contamination in soil and in groundwater. It may take decades to adequately address these issues.
- The department must continue to balance economics and environment by ensuring mineral extraction is conducted in a sustainable, environmentally sound manner.
- End-of-life electronics, or E-Scrap, is increasing the waste stream and contains potentially harmful substances. A quarter billion computers in the U.S. will become obsolete in the next five years. These materials must be handled safely and avenues for recycling and reuse need to be further explored.
- Missouri must continue to strive for better, safer and more convenient disposal of solid and household hazardous wastes while also encouraging residents to minimize their generation of waste and to recycle and reuse as much as possible.



Ongoing Water Quality Concerns

Since the events of December 2005, water quality on the East Fork of the Black River has remained a concern. The floodwaters washed many tons of clay, sand, trees, concrete and rebar downstream, into the park and even further downstream into the Lower Taum Sauk Reservoir, where an estimated 100,000 to 200,000 dump truck loads of sediment and debris were deposited. Clay was also deposited downstream of the Lower Reservoir and cloudy water extended into the Black River and downstream into and through Clearwater Reservoir.

While the Black River has recovered significantly from the disaster in terms of water quality, effects on the fish and invertebrate life in its waters may not be known for several years. The East Fork below the Lower Reservoir dam, which enters the Black River near Lesterville, remains one of the hardest hit stream segments affected by the disaster. Several pools closest to the dam have significant quantities of sediment remaining. This has caused the segment of stream passing through Lesterville to remain cloudy since the event. Upon completion of remediation of the Lower Reservoir, the sediment-laden pools of the East Fork below the dam will be cleaned up.

The department is actively supervising and monitoring Ameren-UE and its contractors in restoring the rivers and the Lower Taum Sauk Reservoir. The long-term goal of the department is to make conditions favorable for the river's water quality to eventually be restored to pre-event conditions, a mission that may take several years to complete.

For additional information, visit the department's Web site at www.dnr.mo.gov/env/taumsauk/index.html.



Johnson's Shut-Ins State Park — A New Beginning

On Dec. 14, 2005, the upper Taum Sauk Reservoir breached, sending 1.3 billion gallons of water down Proffit Mountain and into the main use area of Johnson's Shut-Ins State Park near Lesterville.

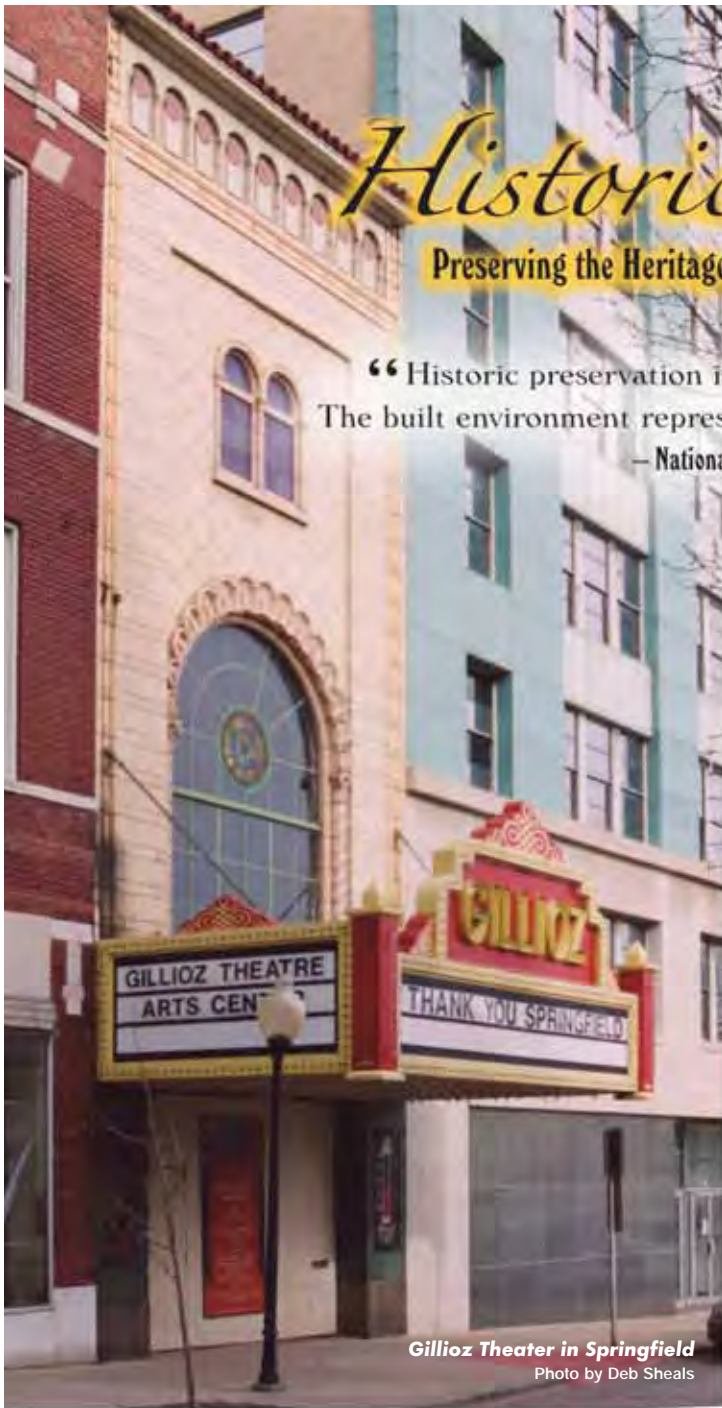
The flooding caused extensive damage to the area of the park along the East Fork of the Black River where most of the park's facilities were. Facilities that were damaged included the campground, water and wastewater systems, the boardwalk to the shut-ins and the superintendent's residence. Trees stripped from the hillside were piled 15 feet high and sand and clay up to 8 feet deep covered much of the area. The water and rocks scoured a hole at the base of the mountain, and rocks created a dam across the river and formed a six-acre lake. A portion of the Taum Sauk Section of the Ozark Trail through the park was damaged.

Once any immediate environmental issues were addressed, the cleanup began. About 15,000 truckloads of sand, debris and mulch from trees were removed from the main area of the park. The campground area was cleared and grass was planted. Workers removed sand and trees by hand from the sensitive fen area, a wetland home to many unusual plants. A notch was cut in the rock dam to drain the lake and a stream restoration plan began to take shape. Roads were repaired and resurfaced. The boardwalk to the shut-ins and the park store were repaired.

Following cleanup, the department was able to reopen the park on May 27, 2006. The summer's experience focused on letting visitors see what happened at the park and interpreting the impact. Guided staff tours, a one-half-mile interpretive trail and a self-guided auto tour were available to help visitors understand the event.

During the spring and summer, work began on the long-term redevelopment of the park. Public input was sought during April at several open houses and online. The proposed plan was presented to the public in August. Several key components in the new plan include moving the campground from its previous location near the river to the Goggins Mountain area of the park, building a new park office/store and interpretive area, and developing an overlook of the scour channel.

The park closed Oct. 2, 2006, so redevelopment could begin. AmerenUE is responsible for rebuilding the park, which the department hopes is fully operational in 2008.



Gillioz Theater in Springfield
Photo by Deb Sheals

Historic Preservation:

Preserving the Heritage, Environment and Economy of Missouri's Communities

“Historic preservation is intrinsically a form of sustainable conservation. The built environment represents the embodied energy of past civilizations.”
— National Park Service, *Guiding Principles for Sustainable Design* (Denver, 1993)

energy consumed in its day-to-day operation and the energy consumed in its creation. To the energy specialist, “embodied energy” is the total expenditure of energy involved in the creation of a building, including the production and transportation of its materials. That wood barn built on a foundation made of local stone has a low (good) embodied energy. Rehabilitating it preserves that already expend-

state, communities and individuals are taking steps to protect, reuse and invest in Missouri's rich legacy of historic resources and places.

Preservation is increasingly becoming integrated into local community planning efforts. The Department of Natural Resources' Certified Local Government (CLG) program provides assistance to more than 40 Missouri communities in their efforts to identify, evaluate and protect the architectural, historic and cultural resources in their city or town.

The CLG program helps local communities carry out preservation policies fairly and for the benefit of all the citizens of the community. Gov. Blunt's DREAM (Downtown Revitalization and Economic Assistance for Missouri) Initiative, which helps communities engage in downtown redevelopment and revitalization, also supports and broadens these historic preservation efforts.

The year 2006 marks the 40th anniversary of the passage of the National Historic Preservation Act of 1966. That act formed a partnership between the federal government and the states to allow input by the state on federally funded or licensed undertakings that impact historic resources.

Through the Section 106 Review and Compliance program, the department works closely with federal agencies on identifying historic resources in project areas, assessing the impact of the undertaking on the identified resources, and developing appropriate mitigation measures for those affected resources.

Last year, more than 2,282 federal undertakings were reviewed by the

Our sense of who we are is rooted in our environment – not only in the ground we stand on, but also in what we as human beings have made of it. Look at your community. Economics and the available technology drove our ancestors' decisions to build using – and re-using – locally available materials.

Today, economics, technology and respect for environment and craftsmanship inspire us to follow in their footsteps. Energy specialists look at two types of energy consumption when considering the efficiency of a building – the

embodied energy while avoiding adding to the demolition debris that takes up 13 percent of Missouri's landfills.

What makes that barn special to your community is a different type of embodied energy – the energy of the people who quarried or gathered the stones, cut and milled the timber and hauled the materials, constructed the barn, and those who worked there over the years. Seeing that embodied energy brought back to life can energize a community, enhance its sense of place, draw visitors and create jobs. Throughout the

Summary of Missouri State Historic Tax Credits Issued

Fiscal Year	# of Projects	Allowable Rehab Costs	Total Investment Costs	Tax Credits Issued
1998	1	\$98,604	\$180,019	\$24,651
1999	20	\$51,308,114	\$55,703,270	\$12,827,028
2000	32	\$82,804,186	\$103,871,045	\$20,701,046
2001	63	\$166,184,147	\$200,104,297	\$41,546,037
2002	93	\$240,045,528	\$310,955,859	\$60,011,382
2003	119	\$356,929,140	\$434,377,644	\$89,214,177
* 2004	179	\$303,113,309	\$344,597,747	\$75,700,295
2005	168	\$320,891,176	\$376,254,903	\$80,222,794
2006	230	\$420,425,150	\$531,605,975	\$105,071,005
TOTAL	905	\$1,941,799,354	\$2,357,650,759	\$485,318,415

* Previous FY 2004 figures have been revised by Missouri Department of Economic Development

Department of Natural Resources' State Historic Preservation Office.

Appreciation of the value of historic resources is one way of fostering their preservation. An increasing number of Missouri's historic resources have been recognized by being formally listed in the National Register of Historic Places, the nation's honor roll of historically significant resources. Missouri now boasts nearly 1,800 listings in the Register representing more than 30,000 individual resources.

Increasingly, Missouri citizens are investing in their historic resources. The passage of the state historic rehabilitation tax credit in 1998 has triggered significant rehabilitation activity in the state. Combined with the federal rehabilitation credits, owners and developers have a potent tool to promote investment in Missouri's historic buildings. Since the creation of the state credits,

rehabilitation projects have been undertaken in communities such as Boonville, Butler, California, Cape Girardeau, Carthage, Chesterfield, Chillicothe, Clarksville, Columbia, Danville, De Soto, Defiance, Excelsior, Farmington, Florissant, Fulton, Hannibal, Hartsburg, Hermann, Independence, Jefferson City, Joplin, Kansas City, Kirkwood, Lexington, Liberty, Louisiana, Manchester, Neosho, New Haven, New Melle, North Kansas City, Osceola, Park Hills, Pilot Grove, Rocheport, Sedalia, St. Charles, St. Joseph, St. Louis, Ste. Genevieve, Springfield, Trenton, University City, West Plains, Weston and Wildwood.

Since the inception of the state rehabilitation tax credits, more than \$2,357,650,759 has been invested in Missouri's rehabilitation projects. For the past several years, Missouri has been a leader nationwide in utilization

of the federal tax credits. In federal FY 2004, Missouri ranked number one in state activity using the federal tax incentives program, with 92 certified projects totaling \$357 million in private investment. In federal FY 2005, Missouri again ranked number one with 92 projects certified.

Thanks to the embodied energy of Missouri's historic buildings, the construction business is booming; developers from other states are investing in projects here, paying Missouri taxes, hiring Missouri workers and contributing to the Missouri Quality Jobs fund; consultants are nominating properties to the National Register; architects are busy designing rehabs that will meet the Secretary's Standards for Historic Rehabilitation; and the Department of Natural Resources' State Historic Preservation Office continues to assist these efforts.

CHALLENGES: Historic Preservation

- Increase awareness of the importance of Missouri's historic resources and encourage educational efforts and approaches for appropriate rehabilitation.
- Assist faith communities, county and local governmental entities and other non-profit groups seeking funding to maintain their historic buildings.
- Continue our efforts to identify, evaluate and recognize the historic resources within the state.

Field Services Division employee Cory Jorgenson employs a portable tablet computer. Using new technology helps staff improve the quality and efficiency of inspections, investigations and environmental emergency response.



Efficiency, Process and Accessibility Improvements

Process Improvements

The department has continued to make changes to improve permit efficiency. The department's regional offices have begun issuing more routine state operating permits while the Water Protection Program handles all major state operating permits and provides direct assistance to the regions. To ensure consistency among permit writers and provide permittees and stakeholders with a greater understanding of the permitting process, the program has also published its permit manual on the Web as of January 2006.

Field Services Created; EAVs Initiated

The department established a new Field Services Division in August 2005, reflecting a focus on improving local services and proactively helping communities and facilities understand and meet environmental regulations.

Fundamental to this new approach has been the development of Environmental Assistance Visits. These visits are an effective tool to help facilities with new permits, providing an

informal and scheduled walk-through of their permit requirements. An EAV provides on-site compliance assistance consultation before the department's first formal inspection at the facility. If a problem is discovered, the facility is expected to make corrections. As of August 2006, nearly 700 assistance visits had been conducted. While many visits found issues requiring attention, only a few facilities had violations serious enough to warrant immediate corrective or enforcement action be taken by the department.

Satellite Offices

As another way to improve local services, new satellite offices were established in the past year at Maryville, Rolla, Portageville, Harry S Truman State Park near Warsaw, Willow Springs and Fredericktown. A temporary office in Carthage was also made a permanent satellite office. Creating offices in these areas has helped direct environmental help closer to where it is needed, and has cut down on the travel time needed to respond to local needs. With these additions, a total of 22 regional, satel-

lite, and project office locations now reach and serve Missouri citizens.

Livestock Market Compliance Initiative

In the spring and summer of 2006 the department's Field Services Division teamed with the Missouri Department of Agriculture's Animal Health Division to offer a special series of compliance assistance visits to all large or weekly livestock markets and stockyards in Missouri. More than 50 Missouri livestock facilities voluntarily took part in the program. During these visits staff consulted with facilities to help them identify the environmental concerns specific to their operations. Suggestions included ways to improve manure storage and management, storm water management and other site design enhancements. As of September 2006, most facilities were in compliance with the department's requirements. The results of this collaboration will be greatly reduced sediment and manure in storm water runoff at many of the sites, and improved water quality in local streams.



MISSOURI DEPARTMENT OF NATURAL RESOURCES





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P.O. Box 176, Jefferson City, MO 65102-0176

1-800-361-4827 for department information

1-800-334-6946 for state parks information

www.dnr.mo.gov